REGIONAL SCIENCE COUNCIL

Unlocking the Mysteries

EPA Region 6 ORD
Scientific/Technical Grants Reference Manual

Prepared by

Regional Science Council

of the

Environmental Protection Agency
Region 6

Dallas, Texas

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(1st Edition)

EPA Region 6 ORD Scientific/Technical Grants Reference Manual

EPA Regional Science Council
Dallas, Texas

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ABSTRACT: This document contains information useful in locating researchers, institutions, congressional districts, and descriptions of grants being administered in EPA Region 6 by EPA's Office of Research and Development (ORD). Grant types include: STAR, STAR FELLOWSHIP, SBIR PHASE I & II, EARLY COMPETED CENTER, and HAZARDOUS SUBSTANCE RESEARCH CENTER. The manual is intended as a reference encyclopedia which enables readers to locate detailed information related to the various grant types. An extended topic index is also included. Since 1995, the ORD grants to Region 6 account for approximately $60 million in applied research.

Regional Science Council
US EPA, Region 6

The Regional Science Council (RSC) is a group of Region 6 scientists who meet monthly to discuss issues, work on specific projects of regionwide interest, and make recommendations to management concerning science matters.

The RSC members are appointed by the Deputy Regional Administrator and the Division Directors, with terms of three years. The RSC represents Region 6 and encourages all EPA employees to share their thoughts and ideas with RSC. While voting is limited to delegates, meetings are open and all interested staff are encouraged to attend.

The overall vision for science in Region 6 is to be a place where: (1) a culture of scientific excellence exists; (2) science collaboration and communication activities are highly effective; (3) the right skills and technical expertise are available to respond to environmental challenges; (4) scientists and decision-makers work to make science a key component to regional priority setting; (5) scientific and technical capabilities are effectively used in achieving regional priorities.

The RSC goals include: (1) Improved quality of regional and national scientific work. (2) Increased use of sound science in regional decision making. (3) More effective planning of scientific work. (4) Better communication of ongoing and completed scientific work.

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Section 1.0

Grant Types

This document is a reference for locating information related to scientific and technical grants administered in EPA Region 6 by EPA's Office of Research and Development (ORD). The grant information available for quick reference includes:

- Congressional Districts and Representatives
- Research Institutions
- Principal Investigators
- Research Subjects

Detailed information related to the various grants is included, as well as an extended topic index.

Several different types of funding are available from ORD for scientific and technical research. These are described below:

1.1 Science to Achieve Results (STAR) Grants

The STAR program is overseen by the National Center for Environmental Research (NCER). This program funds research grants and graduate fellowships in numerous environmental science and engineering disciplines through a competitive solicitation process and independent peer review. The program engages the nation's best scientists and engineers in targeted research that complements EPA's own outstanding intramural research program and those of its partners in other federal agencies. In addition, through this same competitive process, NCER periodically establishes large research centers in specific areas of national concern.

STAR research is funded through Requests for Applications (RFAs) that are derived from the ORD Strategic Plan and from research plans for specific topics developed by ORD. RFAs are prepared in cooperation with other parts of the Agency and concentrate on areas of special significance to the EPA mission.

1.2 Science to Achieve Results (STAR) Fellowships

The STAR Fellowship program encourages promising students to obtain advanced degrees and pursue careers in environmentally-related fields, such as physical, biological, and social sciences and engineering.. This goal is consistent with the mission of EPA, which is to provide leadership in the nation's environmental science, research, education, assessment, restoration, and preservation efforts. The EPA funds graduate fellowships in academic disciplines relating to environmental research. These fellowships are intended to help defray costs associated with advanced environmentally oriented study leading to the master's or doctoral degree. EPA presently supports about 200 STAR fellows nationwide.

1.3 Small Business Innovation Research (SBIR) Phase I and II

The EPA is one of 10 federal agencies that participate in the SBIR Program established by the Small Business Innovation Development Act of 1982. A small business is defined as a for-profit organization with no more than 500 employees. The purpose of the Act is to strengthen the role of small businesses (science- and technology-based firms) in federally funded research and development and to help develop a stronger national base for technical innovation. In addition, the small business must be independently owned and operated, at least 51 percent owned by U.S. citizens or lawfully admitted resident aliens, not dominant in the field of operation in which it is proposing, and have its principal place of business in the United States. Joint ventures and limited partnerships are eligible for SBIR awards, provided the entity created qualifies as a small business. Under Phase I, the scientific merit and technical feasibility of the proposed concept is investigated. Through this phased approach to SBIR funding, EPA can determine whether the research idea, often on high-risk advanced concepts, is technically feasible, whether the business can conduct high-quality research, and whether sufficient progress has been made to justify a larger Phase II effort. Phase II contracts are limited to small businesses that have successfully completed their Phase I contracts. The objective of Phase II is to commercialize the Phase I technology. EPA also offers funding and 1 additional year as Phase II Options for businesses with third-party financing for accelerating commercialization and for technologies accepted into the EPA Environmental Technology Verification (ETV) Program.

1.4 Hazardous Substance Research Center (HSRC)

The HSRC is a national organization that carries out an active program of basic and applied research, technology transfer, and training. Its activities are conducted regionally by five multi-university centers, which focus on different aspects of hazardous substance management. These centers bring together researchers from a variety of disciplines to collaborate on integrated research projects, which involve practical problems of hazardous substance management as well as long-term, exploratory research. The HSRC draws financial support from the EPA, the Department of Energy, and the Department of Defense, with additional funding from academia, industry, and other state and federal government agencies. The designation "Early Competed Center" refers to the earliest-awarded HSRC grants.

Section 2.0

Grant Indices

Section 2.1

Grants by Congressional District

Grants by Congressional Districts

Congr. Dist.	Representative	Ref. #	Institution	Abstract
AR - 02				
	Victor F. (Vic) Snyder [D]			
		25	National Center for Toxicology Research	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer
		25	University of Arkansas for Medical Sciences	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer
		55	University of Arkansas for Medical Sciences	Mechanism(s) of Chloroethylene-Induced Autoimmunity
		178	University of Arkansas for Medical Sciences	How Do Chemicals in Diesel Engine Exhaust Damage DNA?
		190	University of Arkansas for Medical Sciences	DNA Mutations in Rats Treated with a Carcinogen Present in Diesel Exhaust

Congr. Dist.	Representative	Ref. #	Institution	Abstract
AR - 03				
	John Boozman [R]			
		22	University of Arkansas at Fayetteville	Mercury as an Insulin Mimic: Mechanism of Action and Potential Physiological Consequences
		55	University of Arkansas at Fayetteville	Mechanism(s) of Chloroethylene-Induced Autoimmunity
		129	Bioengineering Resources Inc.	High Efficiency Biofilter for Styrene Removal from Indoor Air
		177	University of Arkansas at Fayetteville	Using Plants to Remediate Petroleum-Contaminated Soil

Congr. Dist.	Representative	Ref. #	Institution	Abstract
AR - 04				
	Mike Ross [D]			
		25	University of Arkansas for Medical Sciences,National Center for	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer

Congr. Dist.	Representative	Ref. #	Institution	Abstract
LA - 02				
	William L. Jefferson [D]			
		3	Tulane University of Louisiana	Water as Solvent for Metal-Mediated Carbon-Carbon Bond Formations
		8	Tulane University of Louisiana	Quantitation of Heavy Metals by Immunoassay
		79	Tulane University of Louisiana	Forming Carbon-Carbon Bonds in Water and Other Alternative Media
		115	Tulane University of Louisiana	Habitat Requirements and Evolution of Agrostis Rossiae Vasey, a Grass Endemic to Thermal Soils in Yellowstone National Park
		158	University of New Orleans	Urban Waste Management & Research Center (University of New Orleans)
		159	University of New Orleans	Comprehensive Evaluation of The Dual Trickling Filter Solids Contact Process
		159	University of New Orleans	Comprehensive Evaluation of The Dual Trickling Filter Solids Contact Process
		160	University of New Orleans	Issues Involving the Vertical Expansion of Landfills
		161	University of New Orleans	Deep Foundations on Brownfields Sites
		162	University of New Orleans	Ambient Particulate Concentration Model for Traffic Intersections
		163	University of New Orleans	Effectiveness of Rehabilitation Approaches for I/I Reduction
		164	University of New Orleans	Urban Solid Waste Management Videos
		165	University of New Orleans	UWMRC Community Outreach Multimedia Exhibit
		166	University of New Orleans	Including New Technology into the Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems - A User's Guide
		167	University of New Orleans	Investigation of Hydraulic Characteristics and Alternative Model Development of Subsurface Flow Constructed Wetlands
		168	University of New Orleans	Beneficial Use Of Urban Runoff For Wetland Enhancement

Congr. Dist.	Representative	Ref. #	Institution	Abstract
LA - 02				
		169	University of New Orleans	Urban Storm and Waste Water Outfall Modeling
		181	University of New Orleans	Noninvasive Methods for Measuring Ventilation in Mobile Subjects
		183	Tulane University of Louisiana	Changes in Complex Carbohydrate Content and Structure in Rat Lungs Caused by Prolonged Ozone Inhalation
		192	University of New Orleans	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites
		192	University of New Orleans	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites

Congr. Dist.	Representative	Ref. #	Institution	Abstract
LA - 03				
	W.J. (Billy) Tauzin [R]			
		94	Louisiana Universities Marine Consortium	Human Activities and a Changing Climate in Louisiana

Congr. Dist.	Representative	Ref. #	Institution	Abstract
LA - 05				
	Rodney Alexander [D]			
		40	Northeast Louisiana University	Age and Interactive Toxicity of Organophosphorus Insecticides

Congr. Dist.	Representative	Ref. #	Institution	Abstract
LA - 06				
	Richard Baker [R]			
		30	Louisiana State University - Baton Rouge	Spatial and Temporal Patterns of Larval Fish Morphometrics as Indicators of Ecosystem Health
		39	Louisiana State University - Baton Rouge	Improved Risk Assessment with an Intragenic Mutation Assay
		43	Louisiana State University - Baton Rouge	Improving Air Quality Benefit Estimates from Hedonic Models
		48	Louisiana State University - Baton Rouge	Investigation of the Elementary Reaction Mechanisms of Fly-Ash Mediated Formation of PCDD/F
		71	Louisiana State University - Baton Rouge	Ferric Oxide/Alkali Metal Oxide Induced Oxidation of CHCs in Polluted Gas Streams
		84	Louisiana State University - Baton Rouge	Toward the Development of a Detailed Mechanism of Transition Metal Catalyzed Formation of PCDD/F from Combustion Generated Hydrocarbons
		97	Louisiana State University - Baton Rouge	Modeling the impacts of climate change on wetland ecosystems
		157	Louisiana State University - Baton Rouge	Freshwater Bioturbators in Riverine Sediments as Enhancers of Contaminant Release
		214	Louisiana State University	Sonochemical Treatment of Hazardous Organic Compounds II: Process Optimization and Pathway Studies
		215	Louisiana State University	Laser Diagnostics of the Combustion Process within a Rotary Kiln Incinerator
		226	Louisiana State University	Pollution Prevention by Process Modification Using On-Line Optimization
		232	Louisiana State University	Hazardous Substance Research Center/South and Southwest
		233	Louisiana State University	Bioturbation and Bioavailability of Residual, Desorption-Resistant Contaminants
		235	Louisiana State University - Baton Rouge	Phytoremediation in wetlands and CDFs
		236	Louisiana State University - Baton Rouge	Contaminant Release During Removal and Resuspension

Congr. Dist.	Representative	Ref. #	Institution	Abstract
LA - 07				
	Christopher John [D]			
		95	University of Louisiana at Lafayette	How likely is it that fish populations will successfully adapt to global warming?
		96	University of Louisiana at Lafayette	Saltwater intrusion on the gulf coast: an assessment of the interactions of salinity stress, genetic diversity and population characteristics of fish inhabiting coastal
		97	University of Louisiana at Lafayette	Modeling the impacts of climate change on wetland ecosystems

Congr. Dist.	Representative	Ref. #	Institution	Abstract
NM - 01				
	Heather Wilson [R]			
		10	University of New Mexico - Main Campus	Preference Formation and Elicitation in Valuing Non-Market Goods
		53	Lovelace Respiratory Research Institute	Biological Markers of Exposure to Benzene
		58	Lovelace Respiratory Research Institute	Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats
		60	Lovelace Respiratory Research Institute	Effects of Inhaled Ultrafine Particles on Asthma
		75	University of New Mexico	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana
		78	University of New Mexico	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin
		88	Forest Products Research Center	Fundamental Studies of Wood Interface Modification for Formaldehyde Pollution Avoidance and Prevention
		99	Lovelace Clinic Foundation	Evaluating Microbial Indicators and Health Risks Associated with Bank Filtration
		108	University of New Mexico	Natural hybridization
		116	Environmental Technology and Education Center Inc.	High-Performance, Low-Global-Warming Refrigerants for Domestic Refrigerators
		131	TPL Inc.	Silica Materials for Mercury Recovery From Wastewater
		136	Environmental Technology and Education Center Inc.	High-Performance, Low-Global-Warming Refrigerant for Domestic Refrigerators
		137	Adherent Technologies Inc.	Recycling Process for Poultry Litter
		147	Nimitz Inc.	High Performance, Zero ODP Halon 1301 Replacement
		153	TPL Inc.	Rapid, Specific, Sensor System for Pathogens in Water
		155	Daniel B. Stephens and Associates Inc.	Subsurface Treatment for Arsenic Removal

Congr. Dist.	Representative	Ref. #	Institution	Abstract
NM - 01				
		179	Lovelace Respiratory Research Institute	Does Ozone Cause Precancerous Changes in Cells?
		182	Lovelace Respiratory Research Institute	Effects of Prolonged Ozone Inhalation on Collagen Structure and Content in Rat Lungs
		184	Lovelace Respiratory Research Institute	Pulmonary Function Alterations in Rats After Chronic Ozone Inhalation
		185	Lovelace Respiratory Research Institute	Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose
		186	Lovelace Respiratory Research Institute	Interactive Effects of Nitropyrenes in Diesel Exhaust
		187	Lovelace Respiratory Research Institute	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs
		188	Lovelace Respiratory Research Institute	An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust
		189	Lovelace Respiratory Research Institute	No Evidence For Genetic Mutations Found In Lung Tumors From Rats Exposed To Diesel Exhaust or Carbon Black
		191	Lovelace Respiratory Research Institute	A Pilot Study of Potential Biomarkers of Ozone Exposure
		193	Lovelace Respiratory Research Institute	Penetration of Lung Lining and Clearance of Particles Containing Benzo[a]pyrene
		194	Lovelace Respiratory Research Institute	Metabolism of Ether Oxygenates Added to Gasoline

Congr. Dist.	Representative	Ref. #	Institution	Abstract
NM - 02				
	Stevan E. Pearce [R]			
		2	New Mexico State University	Radiation Scattering by Fractal Clusters in Aerosols
		23	New Mexico State University	Geophysical Sensing in Environmental Applications: Efficient Numerical Simulations
		57	New Mexico State University	A Portable Device for Real-Time Measurement of the Size and Composition of Atmospheric Aerosols
		81	New Mexico State University	Biosensors for Field Monitoring of Organophosphate Pesticides
		106	New Mexico Institute of Mining and Technology	Environmental transport modeling
		114	New Mexico State University	Treatment of Arsenic Contaminated Drinking Water
		141	Bio-Recovery Systems Inc.	Reclamation of Soils and Soil Leachates Contaminated with Heavy Metals

Congr. Dist.	Representative	Ref. #	Institution	Abstract
NM - 03				
	Tom Udall [D]			
		101	New Mexico Highlands University	Reductive Dehalogenation at Electrodes
		124	Southwest Sciences Inc.	A Near-Infrared Diode Laser-Based Continuous Emissions Monitor for Nitrogen Oxides
		135	Southwest Sciences Inc.	Compact, Continuous Monitoring for Volatile Organic Compounds
		139	Southwest Sciences Inc.	Portable Methane Flux Meter

Congr. Dist.	Representative	Ref. #	Institution	Abstract
OK - 01				
	John Sullivan [R]			
		73	City of Tulsa, Oklahoma	The Tulsa Air and Water Quality Information System
		73	University of Tulsa	The Tulsa Air and Water Quality Information System
		73	Indian Nations Council of Government	The Tulsa Air and Water Quality Information System
		73	Oklahoma Department of Environmental Quality	The Tulsa Air and Water Quality Information System
		140	S.R. Taylor and Associates	Novel Cleanup of Metal Working Wastewaters
		156	University of Tulsa	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics
		170	University of Tulsa	Integrated Petroleum Environmental Consortium (IPEC)
		172	University of Tulsa	Passive Sampling Devices (PSDs) for Bioavailability Screening of Soils Containing Petrochemicals
		173	University of Tulsa	Demonstration of a Subsurface Drainage System for the Remediation of Brine-Impacted Soil

Congr. Dist.	Representative	Ref. #	Institution	Abstract
OK - 03				
	Frank Lucas [R]			
		28	Oklahoma State University - Main Campus	Novel Nanocoatings On Cutting Tools For Dry Machining
		35	Oklahoma State University	Development of Chemical Methods to Assess the Bioavailability of Arsenic in Contaminated Media
		38	Oklahoma State University	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River
		40	Oklahoma State University	Age and Interactive Toxicity of Organophosphorus Insecticides
		52	Oklahoma State University	Ecotoxicity Risks Associated with the Land Treatment of Petrochemical Wastes
		110	Oklahoma State University	Critical body residues and ion-exchange membranes as measures of heavy metal bioavailability and toxicity in soil
		150	Fort Environmental Laboratories Inc.	Development and Preliminary Validation of a Rapid Progestin-Based Endocrine Disruption Screening Assay
		172	Oklahoma State University	Passive Sampling Devices (PSDs) for Bioavailability Screening of Soils Containing Petrochemicals

Congr. Dist.	Representative	Ref. #	Institution	Abstract
OK - 04				
	Tom Cole [R]			
		12	University of Oklahoma	Regulation, Business, and Sustainable Development: The Management of Environmentally Conscious Technological Innovation Under Alternative Market
		27	University of Oklahoma	Chemical Plant Wastewater Reuse and Zero Discharge Cycles
		38	University of Oklahoma	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River
		47	University of Oklahoma	The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation
		51	University of Oklahoma	Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment
		61	University of Oklahoma Health Sciences Center,University of	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments
		87	University of Oklahoma	Wastewater Reuse and Zero Discharge Cycles in Process Plants
		90	University of Oklahoma	The Influence of Amphiphilic Molecules on the Environmental Fate and Transport of Pharmaceuticals
		156	University of Oklahoma	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics
		171	University of Oklahoma	Evaluation of Road Base Material Derived from Tank Bottom Sludges
		174	University of Oklahoma	Anaerobic Intrinsic Bioremediation of Whole Gasoline
		175	University of Oklahoma	Microflora Involved in Phytoremediation of Polyaromatic Hydrocarbons
		176	University of Oklahoma	Microbial Treatment of Naturally Occurring Radioactive Material (NORM)

Congr. Dist.	Representative	Ref. #	Institution	Abstract
OK - 05				
	Ernest Istook [R]			
		61	University of Oklahoma Health Sciences Center	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 03				
	Sam Johnson [R]			
		146	MicroFab Technologies Inc.	PheroJet Traps for Areawide Integrated Pest Management

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 04				
	Ralph M. Hall [D]			
		67	Austin College	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 07				
	John Culberson [R]			
		121	Energy Innovations Inc.	Multi- Vortex System for Recovering Volatile Organic Contaminants from Industrial Gas

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 08				
	Kevin Brady [R]			
		5	Texas A & M University	Physiological Effects of Pollutants in the Bottlenose Dolphin
		16	University of Texas: Houston Advanced Research Center -	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 09				
	Nick Lampson [D]			
		45	University of Texas Medical Branch - Galveston	Development of Biomarkers for haloacetonitriles-induced cell injury in Peripheral Blood
		195	Gulf Coast Hazardous Research Center	Gulf Coast Hazardous Substance Research Center (Lamar University)
		196	Lamar University	Field Study Abstract: A Model of Ambient Air Pollution in Southeast Texas Using Artificial Neural Network Technology
		211	Lamar University	The Binding Chemistry and Leaching Mechanisms of Advanced Solidification/Stabilization Systems for Hazardous Waste Management
		212	Lamar University	Development of an Air-Stripping and UV/H2O2 Oxidation Integrated Process To Treat a Chloro-Hydrocarbon-Contaminated Ground Water
		213	Lamar University	A Comparative Study of Siting Opposition in Two Counties
		224	Lamar University	Measurement of Oxygen Transfer Rate in Soil Matrices
		225	Lamar University	Sorbent Technology for Multipollutant Control During Fluidized Bed Incineration
		227	Lamar University	Pollution Prevention by Process Modification
		228	Lamar University	Water Solubility and Henry's Law Constant
		229	Lamar University	Transferring Technical Information on Hazardous Substance Research by Publishing on the World Wide Web

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 10				
	Lloyd Doggett [D]			
		1	University of Texas at Austin	NMR Imaging of Biofilm Growth in Porous Media
		6	University of Texas at Austin	VOC Emissions from Sewers Process Drains and Drop Structures
		9	University of Texas at Austin	How People Respond to Contingent Valuation Questions
		11	University of Texas at Austin	A Framework to Compare Polices for Source Reduction
		16	University of Texas at Austin	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin
		24	University of Texas at Austin	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area
		32	University of Texas at Austin	Developing a New Monitoring Tool for Benthic Organisms in the Gulf of Mexico: Loss of Genetic Variability in Meiofaunal Populations
		33	University of Texas at Austin	A Multi-Scale Investigation of Mass Transfer Limitations in Surfactant-Enhanced Aquifer Remediation
		46	University of Texas at Austin	Reproductive and endocrine effects of o,p'-DDT, an environmental estrogen, and p,p'-DDE, an antiandrogen in male and female Atlantic croaker during critical
		49	University of Texas at Austin	Innovations in Vapor Phase Bioreactor Design
		50	University of Texas at Austin	Role of Microbial Metabolism and Cometabolism in Treating Mixtures of Biodegradable and Nonbiodegradable Chemicals in Granular Activated Carbon
		64	University of Texas at Austin	Theoretical Evaluation of the Interfacial Area between Two Fluids in Soil
		68	University of Texas at Austin	Evaluation of Endocrine-Distrupting Chemical Effects Across Multiple Levels of Biological Organization: Integration of Physiology Behavior and Population
		70	University of Texas at Austin	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian
		72	University of Texas at Austin	Municipal Sewers as Sources of Hazardous Air Pollutants
		85	University of Texas at Austin	Development of Life Cycle Inventory Modules for Semiconductor Processing

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 10				
		91	University of Texas at Austin	Riverbank Filtration Effectiveness in an Arid Environment
		92	University of Texas at Austin	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers
		103	University of Texas at Austin	Intrinsic Bioremediation: Process Demonstration and Evaluation
		104	University of Texas at Austin	Land Use and Natural Butterfly Populations: Assessing Anthropogenic Effects
		105	University of Texas at Austin	Development and Demonstration of a Hollow Fiber Membrane Bioreactor for Cometabolic Degradation of Chlorinated Solvents
		109	University of Texas at Austin	Liquid Phase Mass Transfer in Spray Contactors
		113	University of Texas at Austin	The Roles of Calcium-dependent Signal Transduction and Environmental Xenobiotic Chemicals in Modulating Ovarian Steroidogenesis in Sciaenids
		149	OmniSite BioDiagnostics Inc.	Hand-Held Fluorometer Using SELEX DNA Aptamer Strip Assays To Detect Cryptosporidium and Encephalitozoon
		152	OmniSite BioDiagnostics Inc.	SELEX DNA Aptamer Filter for Removal of Pesticides and Chloroaromatics
		197	University of Texas	Hollow Fiber Membrane Bioreactors for Treating Water and Air Streams Contaminated with Chlorinated Solvents
		198	University of Texas	Fugitive Emissions of Hazardous Air Pollutants from On-Site Industrial Sewers
		199	University of Texas	Biofiltration Technology Development
		200	University of Texas	A Risk-Based Decision Analysis Approach for Aquifers Contaminated with DNAPLs
		201	University of Texas	In-Situ Remediation for Contaminated Soils Using Prefabricated Vertical Drains
		217	University of Texas	Kaolinite Sorbent for the Removal of Heavy Metals from Incinerated Lubricating Oils
		218	University of Texas	Destruction of Chlorinated Hydrocarbons in Process Streams Using Catalytic Steam Reforming
		219	University of Texas	Integrated Process Treatment Train (Bioremediation {Aerobic/Anaerobic} and Immobilization) for Texas Soils Contaminated with Combined Hazardous Wastes

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 15				
	Ruben Hinojosa [D]			
		70	University of Texas - Pan American	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 16				
	Silvestre Reyes [D]			
		18	El Paso Community College	Reversible Inactivation of Viruses in Groundwater
		26	University of Texas at El Paso	An in vivo Model for Detection of Reproductive Effects of Endocrine Disruptors
		74	City of El Paso, Texas	Paso del Norte Environmental Monitor
		74	University of Texas at El Paso	Paso del Norte Environmental Monitor
		111	University of Texas at El Paso	An Enhanced Aerosol Size Distribution Methodology

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 18				
	Sheila Jackson Lee [D]			
		21	Rice University	Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media
		31	University of Houston	Microbial Monitoring With Artificial Stable RNAs
		65	Rice University	Development of a New Gas Sensing System Based on Terahertz Time-Domain Spectroscopy
		89	Rice University	Chinese Tallow Invasions into the Endangered Coastal Prairie: Causes and Consequences
		102	Rice University	Culture, Science and Uncertainty: Conflicting Positions on Climate Change

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 19				
	Larry Combest [R]			
		29	Texas Tech University	Field-Usable Compact Capillary Based Liquid/Ion Chromatographs - Real Time Gas/Aerosol Analyzers
		54	Texas Tech University	Exposure and Response of Morelet's Crocodile (Crocodylus moreletii) Populations to Endocrine Disrupting Compounds in Belize, Central America
		98	Texas Tech University	Interactions among climate, humans and playa wetlands on the Southern High Plains

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 24				
	Martin Frost [D]			
		4	University of Texas at Arlington	Novel Approach to Detoxification of Polychlorinated Solvents A Waste-to-Useful Fuel Conversion
		44	University of Texas at Arlington	Microbial indicators of biological integrity and nutrient stress for aquatic ecosystems

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 25				
	Chris Bell [D]			
		13	University of Texas Health Science Center-Houston	Virulence Factors in Cryptosporidium and Infective Dose in Humans
		14	Baylor College of Medicine	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection
		15	Baylor College of Medicine	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection
		42	University of Texas at Houston	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans
		59	University of Texas at Houston	Airborne Particulate Matter-Induced Lung Inflammation
		76	University of Texas Health Science Center-Houston	Infectivity and Virulence of Cryptosporidium Genotype H Oocysts in Healthy Adult Volunteers
		92	University of Texas at Houston? (UT - Austin,Texas A & M University)	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers
		231	University of Texas at Houston	Life-Cycle Environmental Costing for Managing Pollution Prevention in the Chemical and Petroleum Refining Industries: A Cross-Border Approach

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 26				
	Michael C. Burgess [R]			
		63	City of Denton, Texas	Environmental Condition On-Line DFW Metroplex (ECOPLEX)
		82	University of North Texas	Oxidative Transformation of Model Oxygenated Hazardous Air Pollutants

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 27				
	Solomon P. Ortiz [D]			
		70	University of Texas at Brownsville	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 31				
	John R. Carter [R]			
		7	Prairie View A & M University	Optimization of Oil Biodegradation by Mixed Bacterial and Fungal Population An Innovative Microbial Delivery System and Oil-Absorbing Natural Material
		16	Texas A & M University	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin
		18	Texas A&M Agricultural Research and Extension Center	Reversible Inactivation of Viruses in Groundwater
		19	Texas A & M University	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.
		21	Texas A & M University	Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media
		32	Texas A&M University	Developing a New Monitoring Tool for Benthic Organisms in the Gulf of Mexico: Loss of Genetic Variability in Meiofaunal Populations
		34	Texas A & M University	Bioavailability & Risk Assessment of Complex Mixtures
		36	Texas A & M University	Phytoremediation and Modeling of Land Contaminated by Hydrons
		37	Texas A & M University	Intrinsic Stable Isotopic Tracers of Environmental Contaminants
		66	Texas A & M University	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning
		69	Texas A & M University	Exploring the Environmental Impacts of the E-merging Digital Economy: Towards an Informational Ecology for the Greening of Electronic Commerce
		80	Texas A & M University	Homogeneous Catalysis in Supercritical Carbon Dioxide with Fluoroacrylate Copolymer Supported Catalysts
		83	Texas A & M University	Development of All-Solid-State Sensors for Measurement of Nitric Oxide and Carbon Monoxide Concentrations by Optical Absorption
		86	Texas A & M University	New Sensor Technology for Reducing Emissions from Automobiles
		91	Texas A & M University	Riverbank Filtration Effectiveness in an Arid Environment
		93	Texas A & M University	Gymnodinium breve in the Gulf of Mexico: Gyroxanthin-based Estimates of Carbon-Specific Growth Rates Under Varying Environmental Conditions

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 31				
		100	Texas A & M University	Linking Population and Physiological Diversity in a Toxin-producing Dinoflagellate
		107	Texas A & M University	Image Use in the Characterization of Field Parameters
		112	Texas A & M University	Atmospheric Organic Nitrogen - Origin, Speciation, and Significance in Global Marine Biogeochemistry
		117	Lynntech Inc.	New Environmentally Benign Heteropolymolybdate Conversion Coatings for Aluminum Alloys
		118	Lynntech Inc.	A Novel Method for Converting a Negative Value Waste into a Commodity Chemical
		119	Lynntech Inc.	A New Microfluidic System for the Determination of Cryptosporidium Oocysts in Water
		122	Lynntech Inc.	Improved Method for Heating Catalytic Converters of Vehicles to Attain Ultra-Low Emissions
		123	Lynntech Inc.	Improved Method of Heating Catalytic Converters of Vehicles to Attain Ultra-Low Emissions
		125	Lynntech Inc.	Dual Purpose Electrochemical Treatment of Wastewater
		126	Lynntech Inc.	Electronics Industry Waste Stream Reduction
		127	Lynntech Inc.	Self Contained Electrochemical System for Treating Paint Residue
		130	Lynntech Inc.	Low Cost Heavy Metals Removal from Hazardous Wastewaters
		132	Lynntech Inc.	Novel Field Deployable Electrochemical Sensor for the Detection and Long-Term Monitoring of Pollutants
		133	Lynntech Inc.	Electrochemical Treatment of Textile Effluents with Simultaneous Recovery of Toxic Metals
		134	Lynntech Inc.	New Environmentally Benign Heteropolymolybdate Conversion Coatings for Aluminum Alloys
		138	Lynntech Inc.	The Reduction of Mercury and Sulfur Dioxide Emissions From Coal-Fired Power Plants
		142	Lynntech Inc.	Novel Polymers With Immobilized Antimicrobial Enzymes for Disinfection

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 31				
		143	Lynntech Inc.	A High Efficiency, Extremely Low Emission Internal Combustion Engine With On-Demand Generation of Hydrogen-Rich Gas by a Plasmatron
		144	Lynntech Inc.	A Novel Method for Converting a Negative Value Waste Into a Commodity Chemical
		145	Lynntech Inc.	A New Microfluidic System for the Determination of Cryptosporidium Oocysts in Water
		148	Lynntech Inc.	Novel Method for Ferrate Production
		151	Lynntech Inc.	A Universal Technique for Antimicrobial Surface Preparation Using Quaternary Ammonium-Functionalized Dendrimers
		154	Lynntech Inc.	Novel Method for Ferrate Production
		202	Texas A & M University	Membrane Technology Selection System for the Metal Finishing Industry
		203	Texas A & M University	Stochastic Risk Assessment for Bioremediation
		204	Texas A & M University	Selective Removal of Heavy Metals from Wastewater by Chelation in Supercritical Fluids
		205	Texas A & M University	Optimization of Treatment Technologies for Detoxification of PCB Contaminated Soils
		206	Texas A & M University	Wastewater Remediation by Catalytic Wet Oxidation
		207	Texas A & M University	Permanence of Metals Containment in Solidified and Stabilized Wastes
		208	Texas A & M University	Combustion Enhancement by Radial Jet Reattachment - Low Generation of Hazardous Gases and High Thermal Efficiency
		209	Texas A & M University	A Process To Convert Industrial Biosludge and Paper Fines to Mixed Alcohol Fuels
		210	Texas A & M University	Homogeneous Catalysis in Supercritical Carbon Dioxide
		216	Texas A & M University	Use of Inorganic Ion Exchangers for Hazardous Waste Remediation
		220	Texas A & M University	Photo-Oxidation by H2O2/VisUV of Off-Gas Atmospheric Emissions from Industrial and Environmental Remediation Sources

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 31				
		221	Texas A & M University	Concentrated Halide Extraction and Recovery of Lead from Soil
		222	Texas A & M University	Biodegradable Surfactant for Underground Chlorinated Solvent Remediation
		223	Texas A & M University	A Software Guidance System for Choosing Analytical Subsurface Fate and Transport Models Including a Library of Computer Solutions for the Analytical
		230	Texas A & M University	Stress Protein Responses to Multiple Metal Exposure in Grass Shrimp
		233	Texas A & M University	Bioturbation and Bioavailability of Residual, Desorption-Resistant Contaminants
		234	Texas A & M University	In-Situ Containment and Treatment: Engineering Cap Integrity and Reactivity
		237	Texas A & M University	HSRC Technology Transfer, Training and Outreach

Congr. Dist.	Representative	Ref. #	Institution	Abstract
TX - 32				
	Pete Sessions [R]			
		128	BPF Inc.	Treatment of Produced Water from Coal-Bed Methane Production Using Carbon Aerogel Technology

Section 2.2

Grants by Institution

Grants by Institution

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Adherent Technologies Inc.	137	SBIR Phase I	Recycling Process for Poultry Litter	Allred, Ronald E.	NM - 01
Austin College	67	STAR Grant	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System	Bonzongo, Jean-Claude J.	TX - 04
Baylor College of Medicine	14	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	Estes, Mary K.	TX - 25
Baylor College of Medicine	15	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	Estes, Mary K.	TX - 25
Bioconcervacion	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Contreras, Salvador	MEXICO
Bioengineering Resources Inc.	129	SBIR Phase I	High Efficiency Biofilter for Styrene Removal from Indoor Air	Wikstrom, C. V.	AR - 03
Bio-Recovery Systems Inc.	141	SBIR Phase I	Reclamation of Soils and Soil Leachates Contaminated with Heavy Metals	Hosea, James Michael	NM - 02
BPF Inc.	128	SBIR Phase I	Treatment of Produced Water from Coal-Bed Methane Production Using Carbon Aerogel Technology	Patton, Charles C.	TX - 32
City of Denton, Texas	63	STAR Grant	Environmental Condition On-Line DFW Metroplex (ECOPLEX)	Martin, Howard	TX - 26
City of El Paso, Texas	74	STAR Grant	Paso del Norte Environmental Monitor	Kooshian, Charles	TX - 16
City of Tulsa, Oklahoma	73	STAR Grant	The Tulsa Air and Water Quality Information System	Kitz, Hilary	OK - 01
City of Tulsa,Indian Nations Council of Government,Oklahoma Department of Environmental	73	STAR Grant	The Tulsa Air and Water Quality Information System	Purser, Jane	OK - 01

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
City of Tulsa,Indian Nations Council of Government,Oklahoma Department of Environmental	73	STAR Grant	The Tulsa Air and Water Quality Information System	Potter, William	OK - 01
City of Tulsa,Indian Nations Council of Government,Oklahoma Department of Environmental	73	STAR Grant	The Tulsa Air and Water Quality Information System	Kurlkin, Joanne	OK - 01
Daniel B. Stephens and Associates Inc.	155	SBIR Phase I	Subsurface Treatment for Arsenic Removal	Miller, Gregory P.	NM - 01
Duke University	9	STAR Grant	How People Respond to Contingent Valuation Questions	Payne, John W.	TH CAROLINA
El Paso Community College	18	STAR Grant	Reversible Inactivation of Viruses in Groundwater	Alvarez, Maria E.	TX - 16
Energy Innovations Inc.	121	SBIR Phase I	Multi- Vortex System for Recovering Volatile Organic Contaminants from Industrial Gas	Gourdine, Meredith C.	TX-07
Environmental Technology and Education Center Inc.	116	SBIR Phase II	High-Performance, Low-Global-Warming Refrigerants for Domestic Refrigerators	Nimitz, Jonathan S.	NM - 01
Environmental Technology and Education Center Inc.	136	SBIR Phase I	High-Performance, Low-Global-Warming Refrigerant for Domestic Refrigerators	Nimitz, Jonathan S.	NM - 01
Forest Products Research Center	88	STAR Grant	Fundamental Studies of Wood Interface Modification for Formaldehyde Pollution Avoidance and Prevention	Meister, John J.	NM - 01
Fort Environmental Laboratories Inc.	150	SBIR Phase I	Development and Preliminary Validation of a Rapid Progestin-Based Endocrine Disruption Screening Assay	Fort, Douglas J.	OK - 03
Gulf Coast Hazardous Research Center	195	Hazardou s Substanc	Gulf Coast Hazardous Substance Research Center (Lamar University)	Ho, T. C.	TX - 09
Harvard School of Public Health	180	Hazardou s Substanc	Nitrogen Dioxide and Respiratory Illness in Children	Hunt, William C.	SACHUSETTS
Harvard School of Public Health	180	Hazardou s Substanc	Nitrogen Dioxide and Respiratory Illness in Children	Spengler, John D.	SACHUSETTS

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Harvard School of Public Health	180	Hazardou s Substanc	Nitrogen Dioxide and Respiratory Illness in Children	Skipper, Betty J.	SACHUSETTS
Harvard School of Public Health	180	Hazardou s Substanc	Nitrogen Dioxide and Respiratory Illness in Children	Young, Stephen A.	SACHUSETTS
Harvard School of Public Health	180	Hazardou s Substanc	Nitrogen Dioxide and Respiratory Illness in Children	Schwab, Margo	SACHUSETTS
Harvard School of Public Health	180	Hazardou s Substanc	Nitrogen Dioxide and Respiratory Illness in Children	Samet, Jonathan M.	SACHUSETTS
Harvard School of Public Health	180	Hazardou s Substanc	Nitrogen Dioxide and Respiratory Illness in Children	Cushing, Alice H.	SACHUSETTS
Harvard School of Public Health	180	Hazardou s Substanc	Nitrogen Dioxide and Respiratory Illness in Children	Lambert, William E.	SACHUSETTS
Harvard School of Public Health	180	Hazardou s Substanc	Nitrogen Dioxide and Respiratory Illness in Children	McLaren, Leroy C.	SACHUSETTS
Harvard School of Public Health	180	Hazardou s Substanc	Nitrogen Dioxide and Respiratory Illness in Children	Lambert, William L.	SACHUSETTS
Houston Advanced Research Center,Texas A & M University,University of Texas at	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Edwards, Robert	TX - 08,TX - 10
Hoyle Associates	120	SBIR Phase I	Recycling of Polypropylene Carpet Waste into Polyester Carpet Backcoating	Hoyle, Albert G.	SACHUSETTS
Indian Nations Council of Government	73	STAR Grant	The Tulsa Air and Water Quality Information System	Pinc, Gaylon	OK - 01
Instituto Municipal de Investigacion y Planeacion	74	STAR Grant	Paso del Norte Environmental Monitor	Gonzalez-Ayala, Salvador	MEXICO
Instituto Tecnologico y de Estudios Superiores de Monterrey	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Vogel, Enrique	MEXICO

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Iowa State University	20	STAR Grant	Modeling Spatial and Temporal Dynamics of Montane Meadows and Biodiversity in the Greater Yellowstone Ecosystem	Debinski, Diane	IOWA
Lamar University	196	Hazardou s Substanc	Field Study Abstract: A Model of Ambient Air Pollution in Southeast Texas Using Artificial Neural Network Technology	Hopper, Jack R.	TX - 09
Lamar University	196	Hazardou s Substanc	Field Study Abstract: A Model of Ambient Air Pollution in Southeast Texas Using Artificial Neural Network Technology	Riddle, Anita L.	TX - 09
Lamar University	211	Hazardou s Substanc	The Binding Chemistry and Leaching Mechanisms of Advanced Solidification/Stabilization Systems for Hazardous Waste Management	Cocke, David L	TX - 09
Lamar University	212	Hazardou s Substanc	Development of an Air-Stripping and UV/H2O2 Oxidation Integrated Process To Treat a Chloro-Hydrocarbon-Contaminated Ground Water	Li, Ku-Yen	TX - 09
Lamar University	213	Hazardou s Substanc	A Comparative Study of Siting Opposition in Two Counties	Wright, Stuart A.	TX - 09
Lamar University	224	Hazardou s Substanc	Measurement of Oxygen Transfer Rate in Soil Matrices	Li, Ku-Yen	TX - 09
Lamar University	225	Hazardou s Substanc	Sorbent Technology for Multipollutant Control During Fluidized Bed Incineration	Ho, Thomas C.	TX - 09
Lamar University	227	Hazardou s Substanc	Pollution Prevention by Process Modification	Hopper, Jack R.	TX - 09
Lamar University	227	Hazardou s Substanc	Pollution Prevention by Process Modification	Yaws, Carl L.	TX - 09
Lamar University	228	Hazardou s Substanc	Water Solubility and Henry's Law Constant	Yaws, Carl L.	TX - 09
Lamar University	229	Hazardou s Substanc	Transferring Technical Information on Hazardous Substance Research by Publishing on the World Wide Web	Jordan, Donald L.	TX - 09
Louisiana State University	214	Hazardou s Substanc	Sonochemical Treatment of Hazardous Organic Compounds II: Process Optimization and Pathway Studies	Junk, Thomas	LA - 06

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Louisiana State University	214	Hazardous Substanc	Sonochemical Treatment of Hazardous Organic Compounds II: Process Optimization and Pathway Studies	Catallo, W. James	LA - 06
Louisiana State University	215	Hazardous Substanc	Laser Diagnostics of the Combustion Process within a Rotary Kiln Incinerator	Garrison, Timothy J.	LA - 06
Louisiana State University	226	Hazardous Substanc	Pollution Prevention by Process Modification Using On-Line Optimization	Pike, Ralph W.	LA - 06
Louisiana State University	232	Hazardous Substanc	Hazardous Substance Research Center/South and Southwest	Reible, Danny	LA - 06
Louisiana State University	233	Hazardous Substanc	Bioturbation and Bioavailability of Residual, Desorption-Resistant Contaminants	Reible, Danny	LA - 06
Louisiana State University - Baton Rouge	30	STAR Grant	Spatial and Temporal Patterns of Larval Fish Morphometrics as Indicators of Ecosystem Health	Power, James H.	LA - 06
Louisiana State University - Baton Rouge	39	STAR Grant	Improved Risk Assessment with an Intragenic Mutation Assay	Lee, William R.	LA - 06
Louisiana State University - Baton Rouge	39	STAR Grant	Improved Risk Assessment with an Intragenic Mutation Assay	Wilson, Vincent L.	LA - 06
Louisiana State University - Baton Rouge	43	STAR Grant	Improving Air Quality Benefit Estimates from Hedonic Models	Murdoch, James C.	LA - 06
Louisiana State University - Baton Rouge	43	STAR Grant	Improving Air Quality Benefit Estimates from Hedonic Models	Thayer, Mark	LA - 06
Louisiana State University - Baton Rouge	43	STAR Grant	Improving Air Quality Benefit Estimates from Hedonic Models	Beron, Kurt	LA - 06
Louisiana State University - Baton Rouge	48	STAR Grant	Investigation of the Elementary Reaction Mechanisms of Fly-Ash Mediated Formation of PCDD/F	Khachatryan, Lavrent	LA - 06
Louisiana State University - Baton Rouge	48	STAR Grant	Investigation of the Elementary Reaction Mechanisms of Fly-Ash Mediated Formation of PCDD/F	Dellinger, Barry	LA - 06

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Louisiana State University - Baton Rouge	48	STAR Grant	Investigation of the Elementary Reaction Mechanisms of Fly-Ash Mediated Formation of PCDD/F	Alderman, Steven	LA - 06
Louisiana State University - Baton Rouge	71	STAR Grant	Ferric Oxide/Alkali Metal Oxide Induced Oxidation of CHCs in Polluted Gas Streams	Khachatryan, Lavrent	LA - 06
Louisiana State University - Baton Rouge	71	STAR Grant	Ferric Oxide/Alkali Metal Oxide Induced Oxidation of CHCs in Polluted Gas Streams	Alderman, Steven	LA - 06
Louisiana State University - Baton Rouge	71	STAR Grant	Ferric Oxide/Alkali Metal Oxide Induced Oxidation of CHCs in Polluted Gas Streams	Lomnicki, Slawomir	LA - 06
Louisiana State University - Baton Rouge	71	STAR Grant	Ferric Oxide/Alkali Metal Oxide Induced Oxidation of CHCs in Polluted Gas Streams	Dellinger, Barry	LA - 06
Louisiana State University - Baton Rouge	84	STAR Grant	Toward the Development of a Detailed Mechanism of Transition Metal Catalyzed Formation of PCDD/F from Combustion Generated Hydrocarbons	Dellinger, Barry	LA - 06
Louisiana State University - Baton Rouge	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	Koppelman, David	LA - 06
Louisiana State University - Baton Rouge	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	Ramanujam, Jagannathan	LA - 06
Louisiana State University - Baton Rouge	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	Singh, Vijay P.	LA - 06
Louisiana State University - Baton Rouge	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	Suhayda, Joseph N.	LA - 06
Louisiana State University - Baton Rouge	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	Aravamuthan, Vibhas	LA - 06
Louisiana State University - Baton Rouge	157	Early Competed Center	Freshwater Bioturbators in Riverine Sediments as Enhancers of Contaminant Release	Acholonu, A.D.W.	LA - 06
Louisiana State University - Baton Rouge	157	Early Competed Center	Freshwater Bioturbators in Riverine Sediments as Enhancers of Contaminant Release	Thibodeaux, Louis J.	LA - 06

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Louisiana State University - Baton Rouge	157	Early Competed Center	Freshwater Bioturbators in Riverine Sediments as Enhancers of Contaminant Release	Valsaraj, K.T.	LA - 06
Louisiana State University - Baton Rouge	235	Hazardous Substanc	Phytoremediation in wetlands and CDFs	Pardue, J.	LA - 06
Louisiana State University - Baton Rouge	236	Hazardous Substanc	Contaminant Release During Removal and Resuspension	Tomson, M.	LA - 06
Louisiana State University - Baton Rouge	236	Hazardous Substanc	Contaminant Release During Removal and Resuspension	Thibodeaux, Louis J.	LA - 06
Louisiana Universities Marine Consortium	94	STAR Grant	Human Activities and a Changing Climate in Louisiana	Dagg, Michael	LA - 03
Lovelace Clinic Foundation	99	STAR Grant	Evaluating Microbial Indicators and Health Risks Associated with Bank Filtration	Kunde, Twila	NM - 01
Lovelace Clinic Foundation	99	STAR Grant	Evaluating Microbial Indicators and Health Risks Associated with Bank Filtration	Frost, Floyd	NM - 01
Lovelace Respiratory Research Institute	53	STAR Grant	Biological Markers of Exposure to Benzene	Menache, Margaret	NM - 01
Lovelace Respiratory Research Institute	53	STAR Grant	Biological Markers of Exposure to Benzene	Henderson, Rogene F.	NM - 01
Lovelace Respiratory Research Institute	53	STAR Grant	Biological Markers of Exposure to Benzene	Starr, James	NM - 01
Lovelace Respiratory Research Institute	58	STAR Grant	Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats	Powell, Quint H.	NM - 01
Lovelace Respiratory Research Institute	58	STAR Grant	Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats	Cheng, Yung-Sung	NM - 01
Lovelace Respiratory Research Institute	58	STAR Grant	Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats	Benson, Janet M.	NM - 01

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Lovelace Respiratory Research Institute	58	STAR Grant	Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats	Barrett, Edward G.	NM - 01
Lovelace Respiratory Research Institute	58	STAR Grant	Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats	Bice, David E.	NM - 01
Lovelace Respiratory Research Institute	60	STAR Grant	Effects of Inhaled Ultrafine Particles on Asthma	Barr, E. B.	NM - 01
Lovelace Respiratory Research Institute	60	STAR Grant	Effects of Inhaled Ultrafine Particles on Asthma	Redman, T. K.	NM - 01
Lovelace Respiratory Research Institute	60	STAR Grant	Effects of Inhaled Ultrafine Particles on Asthma	Bice, David E.	NM - 01
Lovelace Respiratory Research Institute	60	STAR Grant	Effects of Inhaled Ultrafine Particles on Asthma	Cheng, Yung-Sung	NM - 01
Lovelace Respiratory Research Institute	60	STAR Grant	Effects of Inhaled Ultrafine Particles on Asthma	Nikula, K. J.	NM - 01
Lovelace Respiratory Research Institute	179	Hazardou s Substanc	Does Ozone Cause Precancerous Changes in Cells?	Thomassen, David G.	NM - 01
Lovelace Respiratory Research Institute	179	Hazardou s Substanc	Does Ozone Cause Precancerous Changes in Cells?	Sun, James D.	NM - 01
Lovelace Respiratory Research Institute	179	Hazardou s Substanc	Does Ozone Cause Precancerous Changes in Cells?	Griffith, William C.	NM - 01
Lovelace Respiratory Research Institute	179	Hazardou s Substanc	Does Ozone Cause Precancerous Changes in Cells?	Harkema, Jack	NM - 01
Lovelace Respiratory Research Institute	179	Hazardou s Substanc	Does Ozone Cause Precancerous Changes in Cells?	Stephens, Nicole D.	NM - 01
Lovelace Respiratory Research Institute	182	Hazardou s Substanc	Effects of Prolonged Ozone Inhalation on Collagen Structure and Content in Rat Lungs	Last, Jerold A.	NM - 01

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Lovelace Respiratory Research Institute	182	Hazardous Substanc	Effects of Prolonged Ozone Inhalation on Collagen Structure and Content in Rat Lungs	Gelzleichter, Thomas R.	NM - 01
Lovelace Respiratory Research Institute	182	Hazardous Substanc	Effects of Prolonged Ozone Inhalation on Collagen Structure and Content in Rat Lungs	Harkema, Jack	NM - 01
Lovelace Respiratory Research Institute	182	Hazardous Substanc	Effects of Prolonged Ozone Inhalation on Collagen Structure and Content in Rat Lungs	Hawk, Susan	NM - 01
Lovelace Respiratory Research Institute	184	Hazardous Substanc	Pulmonary Function Alterations in Rats After Chronic Ozone Inhalation	Harkema, Jack	NM - 01
Lovelace Respiratory Research Institute	184	Hazardous Substanc	Pulmonary Function Alterations in Rats After Chronic Ozone Inhalation	Mauderly, Joe L.	NM - 01
Lovelace Respiratory Research Institute	185	Hazardous Substanc	Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose	Gross, Elizabeth A.	NM - 01
Lovelace Respiratory Research Institute	185	Hazardous Substanc	Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose	Harkema, Jack	NM - 01
Lovelace Respiratory Research Institute	185	Hazardous Substanc	Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose	Morgan, Kevin T.	NM - 01
Lovelace Respiratory Research Institute	185	Hazardous Substanc	Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose	Griffith, William C.	NM - 01
Lovelace Respiratory Research Institute	185	Hazardous Substanc	Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose	Catalano, Paul	NM - 01
Lovelace Respiratory Research Institute	186	Hazardous Substanc	Interactive Effects of Nitropyrenes in Diesel Exhaust	Howard, Paul C.	NM - 01
Lovelace Respiratory Research Institute	186	Hazardous Substanc	Interactive Effects of Nitropyrenes in Diesel Exhaust	Beland, Frederick A.	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Henderson, Rogene F.	NM - 01

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Thomassen, David G.	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Snipes, M. Burton	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Mitchell, Charles	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Griffith, William C.	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Gillett, Nancy A.	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Nikula, K. J.	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Chang, I-Yiin	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Brooks, Antone L.	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Bond, James A.	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Belinsky, Steven A.	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Cheng, Yung-Sung	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Barr, Edward B.	NM - 01
Lovelace Respiratory Research Institute	187	Hazardous Substanc	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Mauderly, Joe L.	NM - 01

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Lovelace Respiratory Research Institute	188	Hazardou s Substanc	An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust	Mauderly, Joe L.	NM - 01
Lovelace Respiratory Research Institute	188	Hazardou s Substanc	An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust	Williams, Paige L.	NM - 01
Lovelace Respiratory Research Institute	188	Hazardou s Substanc	An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust	Putnam, Kim L.	NM - 01
Lovelace Respiratory Research Institute	188	Hazardou s Substanc	An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust	Randerath, Kurt	NM - 01
Lovelace Respiratory Research Institute	188	Hazardou s Substanc	An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust	Randerath, Erika	NM - 01
Lovelace Respiratory Research Institute	189	Hazardou s Substanc	No Evidence For Genetic Mutations Found In Lung Tumors From Rats Exposed To Diesel Exhaust or Carbon Black	Nikula, K. J.	NM - 01
Lovelace Respiratory Research Institute	189	Hazardou s Substanc	No Evidence For Genetic Mutations Found In Lung Tumors From Rats Exposed To Diesel Exhaust or Carbon Black	Swafford, Deborah S.	NM - 01
Lovelace Respiratory Research Institute	189	Hazardou s Substanc	No Evidence For Genetic Mutations Found In Lung Tumors From Rats Exposed To Diesel Exhaust or Carbon Black	Mitchell, Charles	NM - 01
Lovelace Respiratory Research Institute	189	Hazardou s Substanc	No Evidence For Genetic Mutations Found In Lung Tumors From Rats Exposed To Diesel Exhaust or Carbon Black	Belinsky, Steven A.	NM - 01
Lovelace Respiratory Research Institute	191	Hazardou s Substanc	A Pilot Study of Potential Biomarkers of Ozone Exposure	Frampton, Mark W.	NM - 01
Lovelace Respiratory Research Institute	191	Hazardou s Substanc	A Pilot Study of Potential Biomarkers of Ozone Exposure	Pryor, William A.	NM - 01
Lovelace Respiratory Research Institute	193	Hazardou s Substanc	Penetration of Lung Lining and Clearance of Particles Containing Benzo[a]pyrene	Gerde, Per	NM - 01
Lovelace Respiratory Research Institute	194	Hazardou s Substanc	Metabolism of Ether Oxygenates Added to Gasoline	Benson, Janet M.	NM - 01

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Lovelace Respiratory Research Institute	194	Hazardou s Substanc	Metabolism of Ether Oxygenates Added to Gasoline	Hong, Jun-Yan	NM - 01
Lovelace Respiratory Research Institute	194	Hazardou s Substanc	Metabolism of Ether Oxygenates Added to Gasoline	Dekant, Wolfgang	NM - 01
Lynntech Inc.	117	SBIR Phase II	New Environmentally Benign Heteropolymolybdate Conversion Coatings for Aluminum Alloys	Minevski, Zoran	TX - 31
Lynntech Inc.	118	SBIR Phase II	A Novel Method for Converting a Negative Value Waste into a Commodity Chemical	Denvir, Adrian J.	TX - 31
Lynntech Inc.	119	SBIR Phase II	A New Microfluidic System for the Determination of Cryptosporidium Oocysts in Water	Hodko, Dalibor	TX - 31
Lynntech Inc.	122	SBIR Phase I	Improved Method for Heating Catalytic Converters of Vehicles to Attain Ultra-Low Emissions	Murphy, Oliver J.	TX - 31
Lynntech Inc.	123	SBIR Phase II	Improved Method of Heating Catalytic Converters of Vehicles to Attain Ultra-Low Emissions	Murphy, Oliver J.	TX - 31
Lynntech Inc.	125	SBIR Phase I	Dual Purpose Electrochemical Treatment of Wastewater	Tennakoon, Charles	TX - 31
Lynntech Inc.	126	SBIR Phase I	Electronics Industry Waste Stream Reduction	Andrews, Craig C.	TX - 31
Lynntech Inc.	127	SBIR Phase I	Self Contained Electrochemical System for Treating Paint Residue	Tennakoon, Charles	TX - 31
Lynntech Inc.	130	SBIR Phase I	Low Cost Heavy Metals Removal from Hazardous Wastewaters	Bartos, Milan	TX - 31
Lynntech Inc.	132	SBIR Phase I	Novel Field Deployable Electrochemical Sensor for the Detection and Long-Term Monitoring of Pollutants	Denvir, Adrian J.	TX - 31
Lynntech Inc.	133	SBIR Phase I	Electrochemical Treatment of Textile Effluents with Simultaneous Recovery of Toxic Metals	Tennakoon, Charles	TX - 31

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Lynntech Inc.	134	SBIR Phase I	New Environmentally Benign Heteropolymolybdate Conversion Coatings for Aluminum Alloys	Minevski, Zoran	TX - 31
Lynntech Inc.	138	SBIR Phase I	The Reduction of Mercury and Sulfur Dioxide Emissions From Coal-Fired Power Plants	Sylvester, Paul	TX - 31
Lynntech Inc.	142	SBIR Phase I	Novel Polymers With Immobilized Antimicrobial Enzymes for Disinfection	Hitchens, G. Duncan	TX - 31
Lynntech Inc.	143	SBIR Phase I	A High Efficiency, Extremely Low Emission Internal Combustion Engine With On-Demand Generation of Hydrogen-Rich Gas by a Plasmatron	Andrews, Craig C.	TX - 31
Lynntech Inc.	144	SBIR Phase I	A Novel Method for Converting a Negative Value Waste Into a Commodity Chemical	Denvir, Adrian J.	TX - 31
Lynntech Inc.	145	SBIR Phase I	A New Microfluidic System for the Determination of Cryptosporidium Oocysts in Water	Hodko, Dalibor	TX - 31
Lynntech Inc.	148	SBIR Phase I	Novel Method for Ferrate Production	Denvir, Adrian J.	TX - 31
Lynntech Inc.	151	SBIR Phase I	A Universal Technique for Antimicrobial Surface Preparation Using Quaternary Ammonium-Functionalized Dendrimers	Krause, Wendy E.	TX - 31
Lynntech Inc.	154	SBIR Phase I	Novel Method for Ferrate Production	Denvir, Adrian J.	TX - 31
Mesa State College	56	STAR Grant	Photochemical Processes Controlling Manganese Chemistry in Pristine and Contaminated Mountain Streams	Hrncir, Duane	COLORADO
Michigan Technological University	33	STAR Grant	A Multi-Scale Investigation of Mass Transfer Limitations in Surfactant-Enhanced Aquifer Remediation	Mayer, Alex A.	MICHIGAN
MicroFab Technologies Inc.	146	SBIR Phase I	PheroJet Traps for Areawide Integrated Pest Management	Hayes, Donald J.	TX - 03
Minnesota Department of Health	24	STAR Grant	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area	Marbury, M.	MINNESOTA

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Minnesota Pollution Control Agency	24	STAR Grant	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area	Pratt, Greg	MINNESOTA
National Center for Atmospheric Research	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	Thompson, Starley	COLORADO
National Center for Atmospheric Research	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	Katz, Richard	COLORADO
National Center for Atmospheric Research	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	Mearns, Linda	COLORADO
National Center for Toxicology Research	25	STAR Grant	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer	Kadlubar, Fred	AR - 02
NERL and NHEERL, OW - OCPD, Region 4 and 6(Gulf of Mexico Progr	62	STAR Grant	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys	Mueller, Erich	
New Mexico Highlands University	101	STAR Fellowship	Reductive Dehalogenation at Electrodes	Presley, Richard	NM - 03
New Mexico Institute of Mining and Technology	106	STAR Fellowship	Environmental transport modeling	Neupauer, Roseanna M.	NM - 02
New Mexico State University	2	STAR Grant	Radiation Scattering by Fractal Clusters in Aerosols	Shalaev, Vladimir M.	NM - 02
New Mexico State University	2	STAR Grant	Radiation Scattering by Fractal Clusters in Aerosols	Goedecke, George	NM - 02
New Mexico State University	23	STAR Grant	Geophysical Sensing in Environmental Applications: Efficient Numerical Simulations	Liu, Qing-Huo	NM - 02
New Mexico State University	57	STAR Grant	A Portable Device for Real-Time Measurement of the Size and Composition of Atmospheric Aerosols	Eiceman, Gary A.	NM - 02
New Mexico State University	81	STAR Grant	Biosensors for Field Monitoring of Organophosphate Pesticides	Wang, Joseph	NM - 02

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
New Mexico State University	114	STAR Fellowship	Treatment of Arsenic Contaminated Drinking Water	Sanchez, Cassia M.	NM - 02
Nimitz Inc.	147	SBIR Phase I	High Performance, Zero ODP Halon 1301 Replacement	Nimitz, Jonathan S.	NM - 01
Northeast Louisiana University	40	STAR Grant	Age and Interactive Toxicity of Organophosphorus Insecticides	Liu, Jing	LA - 05
Oklahoma Department of Environmental Quality	73	STAR Grant	The Tulsa Air and Water Quality Information System	Jeffries, Rhonda	OK - 01
Oklahoma State University	35	STAR Grant	Development of Chemical Methods to Assess the Bioavailability of Arsenic in Contaminated Media	Basta, Nicholas T.	OK - 03
Oklahoma State University	35	STAR Grant	Development of Chemical Methods to Assess the Bioavailability of Arsenic in Contaminated Media	Rodriguez, Robin R.	OK - 03
Oklahoma State University	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	Willett, Keith D.	OK - 03
Oklahoma State University	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	Focht, Will	OK - 03
Oklahoma State University	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	Caneday, Lowell	OK - 03
Oklahoma State University	40	STAR Grant	Age and Interactive Toxicity of Organophosphorus Insecticides	Pope, Carey	OK - 03
Oklahoma State University	52	STAR Grant	Ecotoxicity Risks Associated with the Land Treatment of Petrochemical Wastes	Janz, David M.	OK - 03
Oklahoma State University	52	STAR Grant	Ecotoxicity Risks Associated with the Land Treatment of Petrochemical Wastes	Qualls, Charles W.	OK - 03
Oklahoma State University	52	STAR Grant	Ecotoxicity Risks Associated with the Land Treatment of Petrochemical Wastes	Lochmiller, Robert L.	OK - 03

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Oklahoma State University	110	STAR Fellowship	Critical body residues and ion-exchange membranes as measures of heavy metal bioavailability and toxicity in soil	Conder, Jason	OK - 03
Oklahoma State University	172	Hazardous Substanc	Passive Sampling Devices (PSDs) for Bioavailability Screening of Soils Containing Petrochemicals	Lanno, Roman	OK - 03
Oklahoma State University - Main Campus	28	STAR Grant	Novel Nanocoatings On Cutting Tools For Dry Machining	Komanduri, Ranga	OK - 03
OmniSite BioDiagnostics Inc.	149	SBIR Phase I	Hand-Held Fluorometer Using SELEX DNA Aptamer Strip Assays To Detect Cryptosporidium and Encephalitozoon	Bruno, John G.	TX - 10
OmniSite BioDiagnostics Inc.	152	SBIR Phase I	SELEX DNA Aptamer Filter for Removal of Pesticides and Chloroaromatics	Bruno, John G.	TX - 10
Oregon State University	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	Adams, Richard M.	OREGON
Pennsylvania State University - Main Campus	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	Easterling, William	:NNSYLVANIA
Prairie View A & M University	7	STAR Grant	Optimization of Oil Biodegradation by Mixed Bacterial and Fungal Population An Innovative Microbial Delivery System and Oil-Absorbing Natural Material	Cuero, Raul G.	TX - 31
Research Triangle Park: Triangle Economic Research	9	STAR Grant	How People Respond to Contingent Valuation Questions	Desvouges, William H.	TH CAROLINA
Rice University	21	STAR Grant	Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media	Djidjev, Hristo	TX - 18
Rice University	21	STAR Grant	Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media	Vardi, Moshe	TX - 18
Rice University	65	STAR Grant	Development of a New Gas Sensing System Based on Terahertz Time-Domain Spectroscopy	Baraniuk, Richard G.	TX - 18
Rice University	65	STAR Grant	Development of a New Gas Sensing System Based on Terahertz Time-Domain Spectroscopy	Mittleman, Daniel M.	TX - 18

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Rice University	89	STAR Grant	Chinese Tallow Invasions into the Endangered Coastal Prairie: Causes and Consequences	Grace, James	TX - 18
Rice University	89	STAR Grant	Chinese Tallow Invasions into the Endangered Coastal Prairie: Causes and Consequences	Rogers, William	TX - 18
Rice University	89	STAR Grant	Chinese Tallow Invasions into the Endangered Coastal Prairie: Causes and Consequences	Siemann, Evan	TX - 18
Rice University	102	STAR Fellowshi p	Culture, Science and Uncertainty: Conflicting Positions on Climate Change	Lahsen, Myanna	TX - 18
S.R. Taylor and Associates	140	SBIR Phase I	Novel Cleanup of Metal Working Wastewaters	Taylor, Scott R.	OK - 01
South Dakota State University	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	Epperson, William P.	)UTH DAKOTA
Southwest Sciences Inc.	124	SBIR Phase I	A Near-Infrared Diode Laser-Based Continuous Emissions Monitor for Nitrogen Oxides	Stanton, Alan C.	NM - 03
Southwest Sciences Inc.	135	SBIR Phase I	Compact, Continuous Monitoring for Volatile Organic Compounds	Hovde, David Christian	NM - 03
Southwest Sciences Inc.	139	SBIR Phase I	Portable Methane Flux Meter	Hovde, David Christian	NM - 03
Stanford University	156	Early Competed Center	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics	Reinhard, Martin	CALIFORNIA
Technology Assessment & Transfer Inc	28	STAR Grant	Novel Nanocoatings On Cutting Tools For Dry Machining	Kustas, Frank	MARYLAND
Technology Assessment & Transfer Inc	28	STAR Grant	Novel Nanocoatings On Cutting Tools For Dry Machining	Fehrenbacher, L.	MARYLAND
Texas A & M University	5	STAR Grant	Physiological Effects of Pollutants in the Bottlenose Dolphin	Busbee, David L.	TX - 08

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Texas A & M University	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Hazelton, Jared	TX - 31
Texas A & M University	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	McCarl, Bruce	TX - 31
Texas A & M University	21	STAR Grant	Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media	Ewing, Richard E.	TX - 31
Texas A & M University	21	STAR Grant	Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media	Lazarov, Raytcho D.	TX - 31
Texas A & M University	34	STAR Grant	Bioavailability & Risk Assessment of Complex Mixtures	McDonald, T. J.	TX - 31
Texas A & M University	34	STAR Grant	Bioavailability & Risk Assessment of Complex Mixtures	Reeves, William	TX - 31
Texas A & M University	34	STAR Grant	Bioavailability & Risk Assessment of Complex Mixtures	Autenrieth, R. L.	TX - 31
Texas A & M University	34	STAR Grant	Bioavailability & Risk Assessment of Complex Mixtures	Safe, S. H.	TX - 31
Texas A & M University	34	STAR Grant	Bioavailability & Risk Assessment of Complex Mixtures	Donnelly, Kirby C.	TX - 31
Texas A & M University	36	STAR Grant	Phytoremediation and Modeling of Land Contaminated by Hydrons	Munster, Clyde	TX - 31
Texas A & M University	36	STAR Grant	Phytoremediation and Modeling of Land Contaminated by Hydrons	Corapcioglu, Yavuz	TX - 31
Texas A & M University	36	STAR Grant	Phytoremediation and Modeling of Land Contaminated by Hydrons	Drew, Malcolm	TX - 31
Texas A & M University	37	STAR Grant	Intrinsic Stable Isotopic Tracers of Environmental Contaminants	Kennicutt, Mahlon C.	TX - 31

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Texas A & M University	66	STAR Grant	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning	Samuelson, Charles D.	TX - 31
Texas A & M University	66	STAR Grant	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning	Peterson, Tarla Rai	TX - 31
Texas A & M University	66	STAR Grant	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning	Neill, William H.	TX - 31
Texas A & M University	66	STAR Grant	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning	Kenimer, Ann L.	TX - 31
Texas A & M University	66	STAR Grant	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning	Matlock, Marty D.	TX - 31
Texas A & M University	66	STAR Grant	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning	Whitten, Guy D.	TX - 31
Texas A & M University	69	STAR Grant	Exploring the Environmental Impacts of the E-merging Digital Economy: Towards an Informational Ecology for the Greening of Electronic Commerce	Sui, Daniel Z.	TX - 31
Texas A & M University	80	STAR Grant	Homogeneous Catalysis in Supercritical Carbon Dioxide with Fluoroacrylate Copolymer Supported Catalysts	Akgerman, Aydin	TX - 31
Texas A & M University	80	STAR Grant	Homogeneous Catalysis in Supercritical Carbon Dioxide with Fluoroacrylate Copolymer Supported Catalysts	Fackler, Jr., John P.	TX - 31
Texas A & M University	83	STAR Grant	Development of All-Solid-State Sensors for Measurement of Nitric Oxide and Carbon Monoxide Concentrations by Optical Absorption	Walther, Thomas	TX - 31
Texas A & M University	83	STAR Grant	Development of All-Solid-State Sensors for Measurement of Nitric Oxide and Carbon Monoxide Concentrations by Optical Absorption	Caton, Jerry	TX - 31
Texas A & M University	83	STAR Grant	Development of All-Solid-State Sensors for Measurement of Nitric Oxide and Carbon Monoxide Concentrations by Optical Absorption	Lucht, Robert P.	TX - 31
Texas A & M University	86	STAR Grant	New Sensor Technology for Reducing Emissions from Automobiles	Taylor, Henry F.	TX - 31

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Texas A & M University	91	STAR Grant	Riverbank Filtration Effectiveness in an Arid Environment	Pillai, Surresh	TX - 31
Texas A & M University	93	STAR Grant	Gymnodinium breve in the Gulf of Mexico: Gyroxanthin-based Estimates of Carbon-Specific Growth Rates Under Varying Environmental Conditions	Pinckney, James L.	TX - 31
Texas A & M University	93	STAR Grant	Gymnodinium breve in the Gulf of Mexico: Gyroxanthin-based Estimates of Carbon-Specific Growth Rates Under Varying Environmental Conditions	Richardson, Tammi L.	TX - 31
Texas A & M University	100	STAR Grant	Linking Population and Physiological Diversity in a Toxin-producing Dinoflagellate	Gold, John R.	TX - 31
Texas A & M University	100	STAR Grant	Linking Population and Physiological Diversity in a Toxin-producing Dinoflagellate	Campbell, Lisa	TX - 31
Texas A & M University	107	STAR Fellowship	Image Use in the Characterization of Field Parameters	Fox, Garey A.	TX - 31
Texas A & M University	112	STAR Fellowship	Atmospheric Organic Nitrogen - Origin, Speciation, and Significance in Global Marine Biogeochemistry	Mace, Kimberly A.	TX - 31
Texas A & M University	202	Hazardous Substanc	Membrane Technology Selection System for the Metal Finishing Industry	Heller, Miriam	TX - 31
Texas A & M University	203	Hazardous Substanc	Stochastic Risk Assessment for Bioremediation	Valdes, Juan B.	TX - 31
Texas A & M University	203	Hazardous Substanc	Stochastic Risk Assessment for Bioremediation	Batchelor, Bill	TX - 31
Texas A & M University	204	Hazardous Substanc	Selective Removal of Heavy Metals from Wastewater by Chelation in Supercritical Fluids	Erkey, Can	TX - 31
Texas A & M University	204	Hazardous Substanc	Selective Removal of Heavy Metals from Wastewater by Chelation in Supercritical Fluids	Akgerman, Aydin	TX - 31
Texas A & M University	205	Hazardous Substanc	Optimization of Treatment Technologies for Detoxification of PCB Contaminated Soils	Donnelly, Kirby C.	TX - 31

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Texas A & M University	205	Hazardous Substanc	Optimization of Treatment Technologies for Detoxification of PCB Contaminated Soils	Dale, Bruce E.	TX - 31
Texas A & M University	206	Hazardous Substanc	Wastewater Remediation by Catalytic Wet Oxidation	Akgerman, Aydin	TX - 31
Texas A & M University	207	Hazardous Substanc	Permanence of Metals Containment in Solidified and Stabilized Wastes	Wilding, Larry P.	TX - 31
Texas A & M University	207	Hazardous Substanc	Permanence of Metals Containment in Solidified and Stabilized Wastes	Batchelor, Bill	TX - 31
Texas A & M University	208	Hazardous Substanc	Combustion Enhancement by Radial Jet Reattachment - Low Generation of Hazardous Gases and High Thermal Efficiency	Seyed-Yagoobi, J.	TX - 31
Texas A & M University	209	Hazardous Substanc	A Process To Convert Industrial Biosludge and Paper Fines to Mixed Alcohol Fuels	Holtzapple, Mark	TX - 31
Texas A & M University	210	Hazardous Substanc	Homogeneous Catalysis in Supercritical Carbon Dioxide	Akgerman, Aydin	TX - 31
Texas A & M University	216	Hazardous Substanc	Use of Inorganic Ion Exchangers for Hazardous Waste Remediation	Clearfield, Abraham	TX - 31
Texas A & M University	216	Hazardous Substanc	Use of Inorganic Ion Exchangers for Hazardous Waste Remediation	Bortun, A. I.	TX - 31
Texas A & M University	220	Hazardous Substanc	Photo-Oxidation by H2O2/VisUV of Off-Gas Atmospheric Emissions from Industrial and Environmental Remediation Sources	Prengle, H. W.	TX - 31
Texas A & M University	220	Hazardous Substanc	Photo-Oxidation by H2O2/VisUV of Off-Gas Atmospheric Emissions from Industrial and Environmental Remediation Sources	Symons, James M.	TX - 31
Texas A & M University	221	Hazardous Substanc	Concentrated Halide Extraction and Recovery of Lead from Soil	Clifford, Dennis	TX - 31
Texas A & M University	222	Hazardous Substanc	Biodegradable Surfactant for Underground Chlorinated Solvent Remediation	Mohanty, Kishore K.	TX - 31

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Texas A & M University	222	Hazardous Substanc	Biodegradable Surfactant for Underground Chlorinated Solvent Remediation	Rajagopalan, Raj	TX - 31
Texas A & M University	223	Hazardous Substanc	A Software Guidance System for Choosing Analytical Subsurface Fate and Transport Models Including a Library of Computer Solutions for the Analytical Models	Williams, Anthony N.	TX - 31
Texas A & M University	223	Hazardous Substanc	A Software Guidance System for Choosing Analytical Subsurface Fate and Transport Models Including a Library of Computer Solutions for the Analytical Models	Cleveland, Theodore G.	TX - 31
Texas A & M University	223	Hazardous Substanc	A Software Guidance System for Choosing Analytical Subsurface Fate and Transport Models Including a Library of Computer Solutions for the Analytical Models	Rixey, William G.	TX - 31
Texas A & M University	230	Hazardous Substanc	Stress Protein Responses to Multiple Metal Exposure in Grass Shrimp	Dobbs, Richard	TX - 31
Texas A & M University	230	Hazardous Substanc	Stress Protein Responses to Multiple Metal Exposure in Grass Shrimp	Howard, Cynthia L.	TX - 31
Texas A & M University	233	Hazardous Substanc	Bioturbation and Bioavailability of Residual, Desorption-Resistant Contaminants	Pardue, J.	TX - 31
Texas A & M University	233	Hazardous Substanc	Bioturbation and Bioavailability of Residual, Desorption-Resistant Contaminants	Fleeger, J. W.	TX - 31
Texas A & M University	234	Hazardous Substanc	In-Situ Containment and Treatment: Engineering Cap Integrity and Reactivity	Wiesner, M.	TX - 31
Texas A & M University	234	Hazardous Substanc	In-Situ Containment and Treatment: Engineering Cap Integrity and Reactivity	Edge, Billy	TX - 31
Texas A & M University	234	Hazardous Substanc	In-Situ Containment and Treatment: Engineering Cap Integrity and Reactivity	Hughes, Joe	TX - 31
Texas A & M University	234	Hazardous Substanc	In-Situ Containment and Treatment: Engineering Cap Integrity and Reactivity	Valsaraj, K. T.	TX - 31
Texas A & M University	237	Hazardous Substanc	HSRC Technology Transfer, Training and Outreach	Ford, Denise Rousseau	TX - 31

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
Texas A & M University	237	Hazardous Substanc	HSRC Technology Transfer, Training and Outreach	Fitzpatrick, Leigh	TX - 31
Texas A & M University	237	Hazardous Substanc	HSRC Technology Transfer, Training and Outreach	Schmitter, Bob	TX - 31
Texas A&M Agricultural Research and Extension Center	18	STAR Grant	Reversible Inactivation of Viruses in Groundwater	Pillai, Surresh	TX - 31
Texas A&M University	32	STAR Grant	Developing a New Monitoring Tool for Benthic Organisms in the Gulf of Mexico: Loss of Genetic Variability in Meiofaunal Populations	Kennicutt, Mahlon C.	TX - 31
Texas Tech University	29	STAR Grant	Field-Usable Compact Capillary Based Liquid/Ion Chromatographs - Real Time Gas/Aerosol Analyzers	Dasgupta, Purnendu K.	TX - 19
Texas Tech University	54	STAR Grant	Exposure and Response of Morelet's Crocodile (*Crocodylus moreletii*) Populations to Endocrine Disrupting Compounds in Belize, Central America	McMurry, Scott T.	TX - 19
Texas Tech University	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Dayawansa, W. P.	TX - 19
Texas Tech University	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Dixon, K. R.	TX - 19
Texas Tech University	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	McMurry, Scott T.	TX - 19
Texas Tech University	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Martin, C. F.	TX - 19
Texas Tech University	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Smith, L. M.	TX - 19
Texas Tech University	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Willis, D. B.	TX - 19
Texas Tech University	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Theodorakis, C. W.	TX - 19

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
TPL Inc.	131	SBIR Phase I	Silica Materials for Mercury Recovery From Wastewater	Kroh, Franklin O.	NM - 01
TPL Inc.	153	SBIR Phase I	Rapid, Specific, Sensor System for Pathogens in Water	Tiernan, Timothy C.	NM - 01
Tufts University	92	STAR Grant	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers	Tzipori, Saul	SACHUSETTS
Tufts University	92	STAR Grant	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers	Widmer, Giovanni	SACHUSETTS
Tulane University of Louisiana	3	STAR Grant	Water as Solvent for Metal-Mediated Carbon-Carbon Bond Formations	Li, Chao-Jun	LA - 02
Tulane University of Louisiana	8	STAR Grant	Quantitation of Heavy Metals by Immunoassay	Blake, Diane A.	LA - 02
Tulane University of Louisiana	79	STAR Grant	Forming Carbon-Carbon Bonds in Water and Other Alternative Media	Li, Chao-Jun	LA - 02
Tulane University of Louisiana	115	STAR Fellowshi p	Habitat Requirements and Evolution of Agrostis Rossiae Vasey, a Grass Endemic to Thermal Soils in Yellowstone National Park	Tercek, Michael T.	LA - 02
Tulane University of Louisiana	183	Hazardou s Substanc	Changes in Complex Carbohydrate Content and Structure in Rat Lungs Caused by Prolonged Ozone Inhalation	ladhakrishnamurthy, Bhandar	LA - 02
Universidad Autonoma de Nuevo Leon	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	de Jesus Navar, Jose	MEXICO
University of Alabama - Tuscaloosa	67	STAR Grant	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System	Chaubey, Indrajeet	ALABAMA
University of Alabama - Tuscaloosa	67	STAR Grant	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System	Bryan, C. Hobson	ALABAMA
University of Alabama - Tuscaloosa	67	STAR Grant	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System	Lyons, W. Berry	ALABAMA

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Alabama - Tuscaloosa	67	STAR Grant	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System	Roden, Eric E.	ALABAMA
University of Alabama - Tuscaloosa	67	STAR Grant	Social Impact Assessment of Human Exposure,to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System	Ward, G. Milton	ALABAMA
University of Arkansas at Fayetteville	22	STAR Grant	Mercury as an Insulin Mimic: Mechanism of Action and Potential Physiological Consequences	Barnes, David M.	AR - 03
University of Arkansas at Fayetteville	177	Hazardou s Substanc	Using Plants to Remediate Petroleum-Contaminated Soil	Thoma, Greg	AR - 03
University of Arkansas at Fayetteville	177	Hazardou s Substanc	Using Plants to Remediate Petroleum-Contaminated Soil	Wolf, Duane	AR - 03
University of Arkansas at Fayetteville	177	Hazardou s Substanc	Using Plants to Remediate Petroleum-Contaminated Soil	Beyrouty, Craig	AR - 03
University of Arkansas for Medical Sciences	25	STAR Grant	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer	Stotts, Craig	AR - 02
University of Arkansas for Medical Sciences	25	STAR Grant	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer	Ambrosone, Christine	AR - 02
University of Arkansas for Medical Sciences	25	STAR Grant	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer	Frame, Lynn	AR - 02
University of Arkansas for Medical Sciences	25	STAR Grant	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer	Lang, Nicholas P.	AR - 02
University of Arkansas for Medical Sciences	55	STAR Grant	Mechanism(s) of Chloroethylene-Induced Autoimmunity	Gilbert, Kathleen M.	ιR - 02,AR - 03
University of Arkansas for Medical Sciences	178	Hazardou s Substanc	How Do Chemicals in Diesel Engine Exhaust Damage DNA?	Beland, Frederick A.	AR - 02
University of Arkansas for Medical Sciences	190	Hazardou s Substanc	DNA Mutations in Rats Treated with a Carcinogen Present in Diesel Exhaust	Beland, Frederick A.	AR - 02

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Arkansas for Medical Sciences,National Center for Toxicology Research	25	STAR Grant	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer	MacLeod, Stewart	R - 02, AR - 04
University of Arkansas for Medical Sciences,University of Arkansas at Fayetteville	55	STAR Grant	Mechanism(s) of Chloroethylene-Induced Autoimmunity	Pumford, Neil R.	\R - 02,AR - 03
University of California - Davis	26	STAR Grant	An in vivo Model for Detection of Reproductive Effects of Endocrine Disruptors	Teh, Swee J.	CALIFORNIA
University of California - Davis	26	STAR Grant	An in vivo Model for Detection of Reproductive Effects of Endocrine Disruptors	Hinton, David E.	CALIFORNIA
University of California - Davis	62	STAR Grant	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys	Anderson, Susan L.	CALIFORNIA
University of California - Davis	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	Atwill, Edward R.	CALIFORNIA
University of California - Davis	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	Sischo, William M.	CALIFORNIA
University of California - Davis	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	Hoar, Bruce	CALIFORNIA
University of California - Davis,South Dakota State University,University of Nebraska	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	Carpenter, L. V.	
University of California - Davis,South Dakota State University,University of Nebraska	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	Elmi, C.	
University of California - Davis,South Dakota State University,University of Nebraska	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	McCluskey, B. J.	
University of California - Davis,South Dakota State University,University of Nebraska	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	Brewster, D.	
University of California - Davis,South Dakota State University,University of Nebraska	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	Riggs, W.	

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of California - Davis,South Dakota State University,University of Nebraska	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	Smith, B.	
University of California - Davis: Bodega Marine Laboratory	62	STAR Grant	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys	Cherr, Gary N.	CALIFORNIA
University of California - Irvine	14	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	Olson, Terese M.	CALIFORNIA
University of California - Irvine	14	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	Grant, Stanley B.	CALIFORNIA
University of California - Irvine	14	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	Ogunseiten, Oladele	CALIFORNIA
University of California - Irvine	15	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	Grant, Stanley B.	CALIFORNIA
University of California - Irvine	15	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	Olson, Terese M.	CALIFORNIA
University of California - Irvine	15	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	Ogunseiten, Oladele	CALIFORNIA
University of California - Riverside	81	STAR Grant	Biosensors for Field Monitoring of Organophosphate Pesticides	Mulchandani, Ashok	CALIFORNIA
University of California - Riverside	81	STAR Grant	Biosensors for Field Monitoring of Organophosphate Pesticides	Chen, Wilfred	CALIFORNIA
University of Colorado at Boulder	56	STAR Grant	Photochemical Processes Controlling Manganese Chemistry in Pristine and Contaminated Mountain Streams	McKnight, Diane M.	COLORADO
University of Dayton	82	STAR Grant	Oxidative Transformation of Model Oxygenated Hazardous Air Pollutants	Taylor, Philip H.	OHIO
University of Delaware	57	STAR Grant	A Portable Device for Real-Time Measurement of the Size and Composition of Atmospheric Aerosols	Johnston, Murray V.	DELAWARE

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Houston	31	STAR Grant	Microbial Monitoring With Artificial Stable RNAs	Willson, Richard C.	TX - 18
University of Houston	31	STAR Grant	Microbial Monitoring With Artificial Stable RNAs	Fox, George E.	TX - 18
University of Kansas Main Campus	20	STAR Grant	Modeling Spatial and Temporal Dynamics of Montane Meadows and Biodiversity in the Greater Yellowstone Ecosystem	Jakubauskas, Mark	KANSAS
University of Kansas Main Campus	20	STAR Grant	Modeling Spatial and Temporal Dynamics of Montane Meadows and Biodiversity in the Greater Yellowstone Ecosystem	Kindscher, Kelly	KANSAS
University of Louisiana at Lafayette	95	STAR Grant	How likely is it that fish populations will successfully adapt to global warming?	Klerks, Paul	LA - 07
University of Louisiana at Lafayette	95	STAR Grant	How likely is it that fish populations will successfully adapt to global warming?	Leberg, Paul. L.	LA - 07
University of Louisiana at Lafayette	96	STAR Grant	Saltwater intrusion on the gulf coast: an assessment of the interactions of salinity stress, genetic diversity and population characteristics of fish inhabiting coastal marshes	Leberg, Paul. L.	LA - 07
University of Louisiana at Lafayette	96	STAR Grant	Saltwater intrusion on the gulf coast: an assessment of the interactions of salinity stress, genetic diversity and population characteristics of fish inhabiting coastal marshes	Klerks, Paul	LA - 07
University of Louisiana at Lafayette	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	Twilley, Robert	LA - 07
University of Minnesota	17	STAR Grant	Alterations of Water Availability, Water Quality and Fish Habitats in Cold Regions by Climate Change	Fang, Xing	MINNESOTA
University of Minnesota	17	STAR Grant	Alterations of Water Availability, Water Quality and Fish Habitats in Cold Regions by Climate Change	Stefan, Heinz G.	MINNESOTA
University of Minnesota	24	STAR Grant	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area	Ramachandran, Gurumurthy	MINNESOTA
University of Minnesota	24	STAR Grant	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area	Sexton, Ken	MINNESOTA

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Minnesota	24	STAR Grant	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area	Waller, Lance	MINNESOTA
University of Minnesota	41	STAR Grant	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure	Ramachandran, Gurumurthy	MINNESOTA
University of Minnesota	41	STAR Grant	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure	Sexton, K.	MINNESOTA
University of Minnesota	41	STAR Grant	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure	Adgate, John L.	MINNESOTA
University of Minnesota	41	STAR Grant	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure	Church, Timothy	MINNESOTA
University of Minnesota	41	STAR Grant	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure	Greaves, Ian	MINNESOTA
University of Minnesota	41	STAR Grant	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure	Tweedie, Richard L.	MINNESOTA
University of Missouri - Columbia	35	STAR Grant	Development of Chemical Methods to Assess the Bioavailability of Arsenic in Contaminated Media	Casteel, Stan W.	MISSOURI
University of Missouri - Kansas City	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	Thiagarajan, Ganesh	MISSOURI
University of Nebraska at Lincoln	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	Grotelueschen, Dale M.	NEBRASKA
University of New Mexico	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	Justic, Dubravko	NM - 01
University of New Mexico	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	Kemp, Paul	NM - 01
University of New Mexico	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	Reyes, Enrique	NM - 01

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of New Mexico	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	Templet, Paul	NM - 01
University of New Mexico	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	Twilley, Robert	NM - 01
University of New Mexico	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	Fry, Brian	NM - 01
University of New Mexico	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	Cable, Jaye	NM - 01
University of New Mexico	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	Day, John	NM - 01
University of New Mexico	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	Cullen, Brad T.	NM - 01
University of New Mexico	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	Snell, Seth	NM - 01
University of New Mexico	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	Scuderi, Louis A.	NM - 01
University of New Mexico	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	Chermak, Janie	NM - 01
University of New Mexico	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	Gregory, Kirk	NM - 01
University of New Mexico	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	Krause, Kate	NM - 01
University of New Mexico	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	Campana, Michael E.	NM - 01
University of New Mexico	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	Brookshire, David S.	NM - 01

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of New Mexico	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	Matthews, Olen Paul	NM - 01
University of New Mexico	108	STAR Fellowship	Natural hybridization	Rosenfield, Jonathan Alan	NM - 01
University of New Mexico - Main Campus	10	STAR Grant	Preference Formation and Elicitation in Valuing Non-Market Goods	Brookshire, David S.	NM - 01
University of New Mexico - Main Campus	10	STAR Grant	Preference Formation and Elicitation in Valuing Non-Market Goods	McKee, Michael	NM - 01
University of New Mexico - Main Campus	10	STAR Grant	Preference Formation and Elicitation in Valuing Non-Market Goods	Kaplan, Hillard	NM - 01
University of New Mexico - Main Campus	10	STAR Grant	Preference Formation and Elicitation in Valuing Non-Market Goods	Jenkins, Hank	NM - 01
University of New Mexico - Main Campus	10	STAR Grant	Preference Formation and Elicitation in Valuing Non-Market Goods	Ganderton, Philip	NM - 01
University of New Mexico - Main Campus	10	STAR Grant	Preference Formation and Elicitation in Valuing Non-Market Goods	Berrens, Robert	NM - 01
University of New Orleans	158	Hazardous Substanc	Urban Waste Management & Research Center (University of New Orleans)	McCorquodale, J. A.	LA - 02
University of New Orleans	158	Hazardous Substanc	Urban Waste Management & Research Center (University of New Orleans)	LaMotta, Enrique	LA - 02
University of New Orleans	158	Hazardous Substanc	Urban Waste Management & Research Center (University of New Orleans)	Sutherlin, John	LA - 02
University of New Orleans	158	Hazardous Substanc	Urban Waste Management & Research Center (University of New Orleans)	Barbe, Donald	LA - 02
University of New Orleans	158	Hazardous Substanc	Urban Waste Management & Research Center (University of New Orleans)	Cothren, Gianna M.	LA - 02

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of New Orleans	158	Hazardou s Substanc	Urban Waste Management & Research Center (University of New Orleans)	Tittlebaum, Marty	LA - 02
University of New Orleans	158	Hazardou s Substanc	Urban Waste Management & Research Center,(University of New Orleans)	Kura, Bhaskar	LA - 02
University of New Orleans	158	Hazardou s Substanc	Urban Waste Management & Research Center (University of New Orleans)	McManis, Kenneth	LA - 02
University of New Orleans	159	Hazardou s Substanc	Comprehensive Evaluation of The Dual Trickling Filter Solids Contact Process	La Motta, Enrique J.	LA - 02
University of New Orleans	159	Hazardou s Substanc	Comprehensive Evaluation of The Dual Trickling Filter Solids Contact Process	Josse, Juan	LA - 02
University of New Orleans	160	Hazardou s Substanc	Issues Involving the Vertical Expansion of Landfills	Debnath, D.	LA - 02
University of New Orleans	160	Hazardou s Substanc	Issues Involving the Vertical Expansion of Landfills	McManis, Kenneth	LA - 02
University of New Orleans	160	Hazardou s Substanc	Issues Involving the Vertical Expansion of Landfills	Nataraj, Mysore	LA - 02
University of New Orleans	160	Hazardou s Substanc	Issues Involving the Vertical Expansion of Landfills	Boutwell, G.	LA - 02
University of New Orleans	161	Hazardou s Substanc	Deep Foundations on Brownfields Sites	Nataraj, Mysore	LA - 02
University of New Orleans	161	Hazardou s Substanc	Deep Foundations on Brownfields Sites	Boutwell, G.	LA - 02
University of New Orleans	161	Hazardou s Substanc	Deep Foundations on Brownfields Sites	McManis, Kenneth	LA - 02
University of New Orleans	162	Hazardou s Substanc	Ambient Particulate Concentration Model for Traffic Intersections	Kura, Bhaskar	LA - 02

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of New Orleans	163	Hazardou s Substanc	Effectiveness of Rehabilitation Approaches for I/I Reduction	Tittlebaum, Marty	LA - 02
University of New Orleans	164	Hazardou s Substanc	Urban Solid Waste Management Videos	Sutherlin, John	LA - 02
University of New Orleans	165	Hazardou s Substanc	UWMRC Community Outreach Multimedia Exhibit	Cothren, Gianna M.	LA - 02
University of New Orleans	166	Hazardou s Substanc	Including New Technology into the Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems - A User's Guide	Pitt, Robert E.	LA - 02
University of New Orleans	166	Hazardou s Substanc	Including New Technology into the Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems - A User's Guide	Lalor, Melinda Marsh	LA - 02
University of New Orleans	166	Hazardou s Substanc	Including New Technology into the Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems - A User's Guide	Barbe, Donald	LA - 02
University of New Orleans	167	Hazardou s Substanc	Investigation of Hydraulic Characteristics and Alternative Model Development of Subsurface Flow Constructed Wetlands	Cothren, Gianna M.	LA - 02
University of New Orleans	168	Hazardou s Substanc	Beneficial Use Of Urban Runoff For Wetland Enhancement	Cothren, Gianna M.	LA - 02
University of New Orleans	168	Hazardou s Substanc	Beneficial Use Of Urban Runoff For Wetland Enhancement	Nyman, J. A.	LA - 02
University of New Orleans	168	Hazardou s Substanc	Beneficial Use Of Urban Runoff For Wetland Enhancement	Hannoura, A. P.	LA - 02
University of New Orleans	169	Hazardou s Substanc	Urban Storm and Waste Water Outfall Modeling	McCorquodale, J. A.	LA - 02
University of New Orleans	181	Hazardou s Substanc	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	Paek, Domyung	LA - 02
University of New Orleans	181	Hazardou s Substanc	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	Mermier, Christine M.	LA - 02

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of New Orleans	181	Hazardou s Substanc	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	Lambert, William E.	LA - 02
University of New Orleans	181	Hazardou s Substanc	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	James, David S.	LA - 02
University of New Orleans	181	Hazardou s Substanc	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	Chick, Thomas W.	LA - 02
University of New Orleans	181	Hazardou s Substanc	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	McCool, F. Dennis	LA - 02
University of New Orleans	181	Hazardou s Substanc	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	Samet, Jonathan M.	LA - 02
University of New Orleans	192	Hazardou s Substanc	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites	Henderson, Rogene F.	LA - 02
University of New Orleans	192	Hazardou s Substanc	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites	Blair, Ian A.	LA - 02
University of New Orleans	192	Hazardou s Substanc	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites	Recio, Leslie	LA - 02
University of New Orleans	192	Hazardou s Substanc	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites	Swenberg, James A.	LA - 02
University of New Orleans	192	Hazardou s Substanc	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites	Walker, Vernon	LA - 02
University of North Texas	63	STAR Grant	Environmental Condition On-Line DFW Metroplex (ECOPLEX)	Kennedy, James H.	TX - 26
University of North Texas	63	STAR Grant	Environmental Condition On-Line DFW Metroplex (ECOPLEX)	Atkinson, Samuel F.	TX - 26
University of North Texas	63	STAR Grant	Environmental Condition On-Line DFW Metroplex (ECOPLEX)	Acevedo, Miguel F.	TX - 26

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of North Texas	63	STAR Grant	Environmental Condition On-Line DFW Metroplex (ECOPLEX)	Dickson, Kenneth L.	TX - 26
University of North Texas	63	STAR Grant	Environmental Condition On-Line DFW Metroplex (ECOPLEX)	Waller, William T.	TX - 26
University of North Texas	82	STAR Grant	Oxidative Transformation of Model Oxygenated Hazardous Air Pollutants	Marshall, Paul	TX - 26
University of Oklahoma	12	STAR Grant	Regulation, Business, and Sustainable Development: The Management of Environmentally Conscious Technological Innovation Under Alternative Market Conditions	Ellington, Rex	OK - 04
University of Oklahoma	12	STAR Grant	Regulation, Business, and Sustainable Development: The Management of Environmentally Conscious Technological Innovation Under Alternative Market Conditions	Meo, Mark	OK - 04
University of Oklahoma	12	STAR Grant	Regulation, Business, and Sustainable Development: The Management of Environmentally Conscious Technological Innovation Under Alternative Market Conditions	Sharfman, Mark	OK - 04
University of Oklahoma	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	Vieux, Baxter	OK - 04
University of Oklahoma	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	Meo, Mark	OK - 04
University of Oklahoma	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	Lynch, R. A.	OK - 04
University of Oklahoma	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	Sankowski, Edward T.	OK - 04
University of Oklahoma	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	Sipes, James	OK - 04
University of Oklahoma	47	STAR Grant	The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation	Knox, Robert	OK - 04
University of Oklahoma	47	STAR Grant	The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation	Sabatini, David A.	OK - 04

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Oklahoma	47	STAR Grant	The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation	Strevett, Keith A.	OK - 04
University of Oklahoma	47	STAR Grant	The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation	Everett, J.	OK - 04
University of Oklahoma	47	STAR Grant	The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation	Tanner, R.	OK - 04
University of Oklahoma	51	STAR Grant	Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment	Philp, R. Paul	OK - 04
University of Oklahoma	51	STAR Grant	Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment	Smallwood, B.	OK - 04
University of Oklahoma	51	STAR Grant	Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment	Kuder, T.	OK - 04
University of Oklahoma	51	STAR Grant	Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment	Kuder, Tomasz	OK - 04
University of Oklahoma	51	STAR Grant	Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment	Smallwood, Barbara	OK - 04
University of Oklahoma	87	STAR Grant	Wastewater Reuse and Zero Discharge Cycles in Process Plants	Savelski, Mariano	OK - 04
University of Oklahoma	87	STAR Grant	Wastewater Reuse and Zero Discharge Cycles in Process Plants	Bagajewicz, Miguel J.	OK - 04
University of Oklahoma	90	STAR Grant	The Influence of Amphiphilic Molecules on the Environmental Fate and Transport of Pharmaceuticals	Sabatini, David A.	OK - 04
University of Oklahoma	90	STAR Grant	The Influence of Amphiphilic Molecules on the Environmental Fate and Transport of Pharmaceuticals	Kibbey, Tohren C. G.	OK - 04
University of Oklahoma	156	Early Competed Center	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics	McInerney, Michael	OK - 04

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Oklahoma	156	Early Competed Center	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics	Tanner, Ralph	OK - 04
University of Oklahoma	156	Early Competed Center	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics	Suflita, Joseph	OK - 04
University of Oklahoma	171	Hazardou s Substanc	Evaluation of Road Base Material Derived from Tank Bottom Sludges	Sanders, Dee Ann	OK - 04
University of Oklahoma	171	Hazardou s Substanc	Evaluation of Road Base Material Derived from Tank Bottom Sludges	Veenstra, John N.	OK - 04
University of Oklahoma	171	Hazardou s Substanc	Evaluation of Road Base Material Derived from Tank Bottom Sludges	Snethen, Donald R.	OK - 04
University of Oklahoma	174	Hazardou s Substanc	Anaerobic Intrinsic Bioremediation of Whole Gasoline	Suflita, Joseph	OK - 04
University of Oklahoma	175	Hazardou s Substanc	Microflora Involved in Phytoremediation of Polyaromatic Hydrocarbons	Fletcher, John S.	OK - 04
University of Oklahoma	175	Hazardou s Substanc	Microflora Involved in Phytoremediation of Polyaromatic Hydrocarbons	Nagle, David P.	OK - 04
University of Oklahoma	176	Hazardou s Substanc	Microbial Treatment of Naturally Occurring Radioactive Material (NORM)	Krumholz, Lee R.	OK - 04
University of Oklahoma	176	Hazardou s Substanc	Microbial Treatment of Naturally Occurring Radioactive Material (NORM)	Hasegawa, Mark	OK - 04
University of Oklahoma Health Sciences Center	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	Lynch, Robert A.	OK - 05
University of Oklahoma Health Sciences Center	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	Clinkenbeard, R.	OK - 05
University of Oklahoma Health Sciences Center	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	Marcham, Cheri	OK - 05

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Oklahoma Health Sciences Center	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	Agron, Gina	OK - 05
University of Oklahoma Health Sciences Center	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	Phillips, Margaret L.	OK - 05
University of Oklahoma Health Sciences Center	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	Johnson, David. L.	OK - 05
University of Oklahoma Health Sciences Center	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	Esmen, Nurtan. A.	OK - 05
University of Oklahoma Health Sciences Center	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	Hall, Thomas. A.	OK - 05
University of Oklahoma Health Sciences Center,University of Oklahoma	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	Gibson, Aaron	)K - 04,OK - 06
University of Oklahoma Health Sciences Center,University of Oklahoma	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	Wang, D.	)K - 04,OK - 06
University of Oklahoma Health Sciences Center,University of Oklahoma	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	Moss, S. K.	)K - 04,OK - 06
University of Oklahoma Norman Campus	27	STAR Grant	Chemical Plant Wastewater Reuse and Zero Discharge Cycles	Bagajewicz, Miguel J.	OK - 04
University of South Carolina at Columbia	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	Carbone, Greg	TH CAROLINA
University of Texas	197	Hazardou s Substanc	Hollow Fiber Membrane Bioreactors for Treating Water and Air Streams Contaminated with Chlorinated Solvents	Georgiou, George	TX - 10
University of Texas	197	Hazardou s Substanc	Hollow Fiber Membrane Bioreactors for Treating Water and Air Streams Contaminated with Chlorinated Solvents	Speitel, Gerald E.	TX - 10
University of Texas	198	Hazardou s Substanc	Fugitive Emissions of Hazardous Air Pollutants from On-Site Industrial Sewers	Corsi, Richard L.	TX - 10

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Texas	199	Hazardou s Substanc	Biofiltration Technology Development	Loehr, Raymond C.	TX - 10
University of Texas	200	Hazardou s Substanc	A Risk-Based Decision Analysis Approach for Aquifers Contaminated with DNAPLs	Gilbert, Robert B.	TX - 10
University of Texas	200	Hazardou s Substanc	A Risk-Based Decision Analysis Approach for Aquifers Contaminated with DNAPLs	McKinney, Daene C.	TX - 10
University of Texas	201	Hazardou s Substanc	In-Situ Remediation for Contaminated Soils Using Prefabricated Vertical Drains	Bowders, John J.	TX - 10
University of Texas	201	Hazardou s Substanc	In-Situ Remediation for Contaminated Soils Using Prefabricated Vertical Drains	Daniel, David E.	TX - 10
University of Texas	217	Hazardou s Substanc	Kaolinite Sorbent for the Removal of Heavy Metals from Incinerated Lubricating Oils	Hall, Matthew J.	TX - 10
University of Texas	218	Hazardou s Substanc	Destruction of Chlorinated Hydrocarbons in Process Streams Using Catalytic Steam Reforming	Richardson, James T.	TX - 10
University of Texas	219	Hazardou s Substanc	Integrated Process Treatment Train (Bioremediation {Aerobic/Anaerobic} and Immobilization) for Texas Soils Contaminated with Combined Hazardous Wastes	Vipulanandan, C.	TX - 10
University of Texas	219	Hazardou s Substanc	Integrated Process Treatment Train (Bioremediation {Aerobic/Anaerobic} and Immobilization) for Texas Soils Contaminated with Combined Hazardous Wastes	Clifford, Dennis	TX - 10
University of Texas	219	Hazardou s Substanc	Integrated Process Treatment Train (Bioremediation {Aerobic/Anaerobic} and Immobilization) for Texas Soils Contaminated with Combined Hazardous Wastes	Roberts, D. J.	TX - 10
University of Texas - Pan American	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments	Lonard, Robert	TX - 15
University of Texas - Pan American	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments	Rieken, Eric	TX - 15
University of Texas - Pan American	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments	Judd, Frank	TX - 15

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Texas at Arlington	4	STAR Grant	Novel Approach to Detoxification of Polychlorinated Solvents A Waste-to-Useful Fuel Conversion	Timmons, Richard B.	TX - 24
University of Texas at Arlington	44	STAR Grant	Microbial indicators of biological integrity and nutrient stress for aquatic ecosystems	Grover, James P.	TX - 24
University of Texas at Arlington	44	STAR Grant	Microbial indicators of biological integrity and nutrient stress for aquatic ecosystems	Chrzanowski, Thomas H.	TX - 24
University of Texas at Austin	1	STAR Grant	NMR Imaging of Biofilm Growth in Porous Media	Sharma, Mukul M.	TX - 10
University of Texas at Austin	1	STAR Grant	NMR Imaging of Biofilm Growth in Porous Media	Majors, Paul D.	TX - 10
University of Texas at Austin	1	STAR Grant	NMR Imaging of Biofilm Growth in Porous Media	Georgiou, George	TX - 10
University of Texas at Austin	6	STAR Grant	VOC Emissions from Sewers Process Drains and Drop Structures	Corsi, Richard L.	TX - 10
University of Texas at Austin	9	STAR Grant	How People Respond to Contingent Valuation Questions	Schkade, David A.	TX - 10
University of Texas at Austin	11	STAR Grant	A Framework to Compare Polices for Source Reduction	Fullerton, Don	TX - 10
University of Texas at Austin	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Ward, George	TX - 10
University of Texas at Austin	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Barajas, Ismael Aguilar	TX - 10
University of Texas at Austin	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Armstrong, Neal	TX - 10
University of Texas at Austin	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Chapa, Liliana	TX - 10

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Texas at Austin	24	STAR Grant	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area	Stock, Tom	TX - 10
University of Texas at Austin	32	STAR Grant	Developing a New Monitoring Tool for Benthic Organisms in the Gulf of Mexico: Loss of Genetic Variability in Meiofaunal Populations	Montagna, Paul A.	TX - 10
University of Texas at Austin	33	STAR Grant	A Multi-Scale Investigation of Mass Transfer Limitations in Surfactant-Enhanced Aquifer Remediation	Pope, Gary A.	TX - 10
University of Texas at Austin	46	STAR Grant	Reproductive and endocrine effects of o,p'-DDT, an environmental estrogen, and p,p'-DDE, an antiandrogen in male and female Atlantic croaker during critical periods of their reproductive life history cycles	Thomas, Peter	TX - 10
University of Texas at Austin	49	STAR Grant	Innovations in Vapor Phase Bioreactor Design	Kinney, Kerry A.	TX - 10
University of Texas at Austin	50	STAR Grant	Role of Microbial Metabolism and Cometabolism in Treating Mixtures of Biodegradable and Nonbiodegradable Chemicals in Granular Activated Carbon Columns	Speitel, Gerald E.	TX - 10
University of Texas at Austin	64	STAR Grant	Theoretical Evaluation of the Interfacial Area between Two Fluids in Soil	Noble, Beth	TX - 10
University of Texas at Austin	64	STAR Grant	Theoretical Evaluation of the Interfacial Area between Two Fluids in Soil	Johnson, Anna	TX - 10
University of Texas at Austin	64	STAR Grant	Theoretical Evaluation of the Interfacial Area between Two Fluids in Soil	Bryant, Steven	TX - 10
University of Texas at Austin	64	STAR Grant	Theoretical Evaluation of the Interfacial Area between Two Fluids in Soil	Gladkikh, Mikhail	TX - 10
University of Texas at Austin	68	STAR Grant	Evaluation of Endocrine-Distrupting Chemical Effects Across Multiple Levels of Biological Organization: Integration of Physiology Behavior and Population Dynamics In Fishes	Rose, K. A.	TX - 10
University of Texas at Austin	68	STAR Grant	Evaluation of Endocrine-Distrupting Chemical Effects Across Multiple Levels of Biological Organization: Integration of Physiology Behavior and Population Dynamics In Fishes	Fuiman, L. A.	TX - 10
University of Texas at Austin	68	STAR Grant	Evaluation of Endocrine-Distrupting Chemical Effects Across Multiple Levels of Biological Organization: Integration of Physiology Behavior and Population Dynamics In Fishes	Thomas, Peter	TX - 10

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Texas at Austin	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments	Tremblay, Thomas	TX - 10
University of Texas at Austin	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments	Neuenschwander, Amy	TX - 10
University of Texas at Austin	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments	White, William A.	TX - 10
University of Texas at Austin	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments	Crawford, Melba	TX - 10
University of Texas at Austin	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments	Raney, Jay	TX - 10
University of Texas at Austin	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments	Sullivan, Jeri	TX - 10
University of Texas at Austin	72	STAR Grant	Municipal Sewers as Sources of Hazardous Air Pollutants	Corsi, Richard L.	TX - 10
University of Texas at Austin	85	STAR Grant	Development of Life Cycle Inventory Modules for Semiconductor Processing	Murphy, Cynthia F.	TX - 10
University of Texas at Austin	85	STAR Grant	Development of Life Cycle Inventory Modules for Semiconductor Processing	Allen, David T.	TX - 10
University of Texas at Austin	91	STAR Grant	Riverbank Filtration Effectiveness in an Arid Environment	Langford, Richard P.	TX - 10
University of Texas at Austin	91	STAR Grant	Riverbank Filtration Effectiveness in an Arid Environment	Schulze-Makuch, Dirk	TX - 10
University of Texas at Austin	92	STAR Grant	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers	Okhuysen, Pablo C.	TX - 10
University of Texas at Austin	103	STAR Fellowship	Intrinsic Bioremediation: Process Demonstration and Evaluation	Williamson, Derek	TX - 10

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Texas at Austin	104	STAR Fellowship	Land Use and Natural Butterfly Populations: Assessing Anthropogenic Effects	Boughton, David A.	TX - 10
University of Texas at Austin	105	STAR Fellowship	Development and Demonstration of a Hollow Fiber Membrane Bioreactor for Cometabolic Degradation of Chlorinated Solvents	Pressman, Jonathan G.	TX - 10
University of Texas at Austin	109	STAR Fellowship	Liquid Phase Mass Transfer in Spray Contactors	Yeh, Norman K.	TX - 10
University of Texas at Austin	113	STAR Fellowship	The Roles of Calcium-dependent Signal Transduction and Environmental Xenobiotic Chemicals in Modulating Ovarian Steroidogenesis in Sciaenids	Benninghoff, Abby Diane	TX - 10
University of Texas at Brownsville	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments	Paull, Gene	TX - 27
University of Texas at Brownsville	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments	Gonzales-Ramos, Javier	TX - 27
University of Texas at El Paso	26	STAR Grant	An in vivo Model for Detection of Reproductive Effects of Endocrine Disruptors	Washburn, Barbara S.	TX - 16
University of Texas at El Paso	74	STAR Grant	Paso del Norte Environmental Monitor	Gray, Robert	TX - 16
University of Texas at El Paso	111	STAR Fellowship	An Enhanced Aerosol Size Distribution Methodology	Pearson, Roderick R.	TX - 16
University of Texas at Houston	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	del Junco, Deborah	TX - 25
University of Texas at Houston	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	Wun, Chuan-Chuan	TX - 25
University of Texas at Houston	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	Wu, Xifeng	TX - 25
University of Texas at Houston	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	Symanski, Elaine	TX - 25

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Texas at Houston	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	Denison, Michael	TX - 25
University of Texas at Houston	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	Cooper, Sharon	TX - 25
University of Texas at Houston	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	Sweeney, Anne	TX - 25
University of Texas at Houston	59	STAR Grant	Airborne Particulate Matter-Induced Lung Inflammation	Morandi, Maria T.	TX - 25
University of Texas at Houston	59	STAR Grant	Airborne Particulate Matter-Induced Lung Inflammation	Holian, Andrij	TX - 25
University of Texas at Houston	59	STAR Grant	Airborne Particulate Matter-Induced Lung Inflammation	Parsley, Edwin	TX - 25
University of Texas at Houston	231	Hazardou s Substanc	Life-Cycle Environmental Costing for Managing Pollution Prevention in the Chemical and Petroleum Refining Industries: A Cross-Border Approach	Beloff, Beth	TX - 25
University of Texas at Houston	231	Hazardou s Substanc	Life-Cycle Environmental Costing for Managing Pollution Prevention in the Chemical and Petroleum Refining Industries: A Cross-Border Approach	Heller, Miriam	TX - 25
University of Texas at Houston	231	Hazardou s Substanc	Life-Cycle Environmental Costing for Managing Pollution Prevention in the Chemical and Petroleum Refining Industries: A Cross-Border Approach	Shields, David	TX - 25
University of Texas at Houston? (UT - Austin,Texas A & M University)	92	STAR Grant	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers	DuPont, Herbert L.	
University of Texas Health Science Center-Houston	13	STAR Grant	Virulence Factors in Cryptosporidium and Infective Dose in Humans	Okhuysen, Pablo C.	TX - 25
University of Texas Health Science Center-Houston	13	STAR Grant	Virulence Factors in Cryptosporidium and Infective Dose in Humans	Chappell, Cynthia L.	TX - 25
University of Texas Health Science Center-Houston	13	STAR Grant	Virulence Factors in Cryptosporidium and Infective Dose in Humans	Sterling, Charles R.	TX - 25

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Texas Health Science Center-Houston	13	STAR Grant	Virulence Factors in Cryptosporidium and Infective Dose in Humans	DuPont, Herbert L.	TX - 25
University of Texas Health Science Center-Houston	76	STAR Grant	Infectivity and Virulence of Cryptosporidium Genotype H Oocysts in Healthy Adult Volunteers	Tzipori, Saul	TX - 25
University of Texas Health Science Center-Houston	76	STAR Grant	Infectivity and Virulence of Cryptosporidium Genotype H Oocysts in Healthy Adult Volunteers	Okhuysen, Pablo C.	TX - 25
University of Texas Health Science Center-Houston	76	STAR Grant	Infectivity and Virulence of Cryptosporidium Genotype H Oocysts in Healthy Adult Volunteers	Chappell, Cynthia L.	TX - 25
University of Texas Health Science Center-Houston	76	STAR Grant	Infectivity and Virulence of Cryptosporidium Genotype H Oocysts in Healthy Adult Volunteers	Widmer, Giovanni	TX - 25
University of Texas Health Science Center-Houston?	92	STAR Grant	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers	Chappell, Cynthia L.	
University of Texas Medical Branch - Galveston	45	STAR Grant	Development of Biomarkers for haloacetonitriles-induced cell injury in Peripheral Blood	Ahmed, Ahmed Elsayed	TX - 09
University of Texas Medical School at Houston	92	STAR Grant	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers	Janecki, Andrzej	TX - 25
University of Texas: Houston Advanced Research Center - Woodlands	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Sisbarro, Daniel J.	TX - 08
University of Texas: Houston Advanced Research Center - Woodlands	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Mathis, Mitchell	TX - 08
University of Texas: Houston Advanced Research Center--Woodlands	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Schmandt, Jurgen	TX - 08
University of Tulsa	156	Early Competed Center	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics	Sublette, Kerry	OK - 01
University of Tulsa	170	Hazardou s Substanc	Integrated Petroleum Environmental Consortium (IPEC)	Sublette, Kerry	OK - 01

Institution	Ref. #	Grant	Abstract	Investigator	Cong. Dist.
University of Tulsa	172	Hazardous Substanc	Passive Sampling Devices (PSDs) for Bioavailability Screening of Soils Containing Petrochemicals	Duncan, Kathleen	OK - 01
University of Tulsa	173	Hazardous Substanc	Demonstration of a Subsurface Drainage System for the Remediation of Brine-Impacted Soil	Harris, Thomas M.	OK - 01
University of Tulsa	173	Hazardous Substanc	Demonstration of a Subsurface Drainage System for the Remediation of Brine-Impacted Soil	Veenstra, John N.	OK - 01
University of Virginia	37	STAR Grant	Intrinsic Stable Isotopic Tracers of Environmental Contaminants	Macko, Stephen A.	VIRGINIA
US EPA NERL: Athens, GA	62	STAR Grant	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys	Zepp, Richard	GEORGIA
US EPA NHEERL: Gulf Breeze, FL	62	STAR Grant	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys	Hansen, Lara	FLORIDA
US EPA NHEERL: Gulf Breeze, FL	62	STAR Grant	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys	Santavy, Debbie	FLORIDA

Section 2.3

Grants by Investigator

Grants by Investigator

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Acevedo, Miguel F.	63	STAR Grant	Environmental Condition On-Line DFW Metroplex (ECOPLEX)	University of North Texas	TX - 26
Acholonu, A.D.W.	157	Early Competed Center	Freshwater Bioturbators in Riverine Sediments as Enhancers of Contaminant Release	Louisiana State University - Baton Rouge	LA - 06
Adams, Richard M.	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	Oregon State University	OREGON
Adgate, John L.	41	STAR Grant	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure	University of Minnesota	MINNESOTA
Agron, Gina	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	University of Oklahoma Health Sciences Center	OK - 05
Ahmed, Ahmed Elsayed	45	STAR Grant	Development of Biomarkers for haloacetonitriles-induced cell injury in Peripheral Blood	University of Texas Medical Branch - Galveston	TX - 09
Akgerman, Aydin	80	STAR Grant	Homogeneous Catalysis in Supercritical Carbon Dioxide with Fluoroacrylate Copolymer Supported Catalysts	Texas A & M University	TX - 31
Akgerman, Aydin	204	Hazardous Substance	Selective Removal of Heavy Metals from Wastewater by Chelation in Supercritical Fluids	Texas A & M University	TX - 31
Akgerman, Aydin	206	Hazardous Substance	Wastewater Remediation by Catalytic Wet Oxidation	Texas A & M University	TX - 31
Akgerman, Aydin	210	Hazardous Substance	Homogeneous Catalysis in Supercritical Carbon Dioxide	Texas A & M University	TX - 31
Alderman, Steven	48	STAR Grant	Investigation of the Elementary Reaction Mechanisms of Fly-Ash Mediated Formation of PCDD/F	Louisiana State University - Baton Rouge	LA - 06
Alderman, Steven	71	STAR Grant	Ferric Oxide/Alkali Metal Oxide Induced Oxidation of CHCs in Polluted Gas Streams	Louisiana State University - Baton Rouge	LA - 06

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Allen, David T.	85	STAR Grant	Development of Life Cycle Inventory Modules for Semiconductor Processing	University of Texas at Austin	TX - 10
Allred, Ronald E.	137	SBIR Phase I	Recycling Process for Poultry Litter	Adherent Technologies Inc.	NM - 01
Alvarez, Maria E.	18	STAR Grant	Reversible Inactivation of Viruses in Groundwater	El Paso Community College	TX - 16
Ambrosone, Christine	25	STAR Grant	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer	University of Arkansas for Medical Sciences	AR - 02
Anderson, Susan L.	62	STAR Grant	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys	University of California - Davis	CALIFORNIA
Andrews, Craig C.	126	SBIR Phase I	Electronics Industry Waste Stream Reduction	Lynntech Inc.	TX - 31
Andrews, Craig C.	143	SBIR Phase I	A High Efficiency, Extremely Low Emission Internal Combustion Engine With On-Demand Generation of Hydrogen-Rich Gas by a Plasmatron	Lynntech Inc.	TX - 31
Aravamuthan, Vibhas	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	Louisiana State University - Baton Rouge	LA - 06
Armstrong, Neal	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	University of Texas at Austin	TX - 10
Atkinson, Samuel F.	63	STAR Grant	Environmental Condition On-Line DFW Metroplex (ECOPLEX)	University of North Texas	TX - 26
Atwill, Edward R.	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	University of California - Davis	CALIFORNIA
Autenrieth, R. L.	34	STAR Grant	Bioavailability & Risk Assessment of Complex Mixtures	Texas A & M University	TX - 31
Bagajewicz, Miguel J.	27	STAR Grant	Chemical Plant Wastewater Reuse and Zero Discharge Cycles	University of Oklahoma Norman Campus	OK - 04

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Bagajewicz, Miguel J.	87	STAR Grant	Wastewater Reuse and Zero Discharge Cycles in Process Plants	University of Oklahoma	OK - 04
Barajas, Ismael Aguilar	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	University of Texas at Austin	TX - 10
Baraniuk, Richard G.	65	STAR Grant	Development of a New Gas Sensing System Based on Terahertz Time-Domain Spectroscopy	Rice University	TX - 18
Barbe, Donald	158	Hazardous Substance	Urban Waste Management & Research Center (University of New Orleans)	University of New Orleans	LA - 02
Barbe, Donald	166	Hazardous Substance	Including New Technology into the Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems - A User's Guide	University of New Orleans	LA - 02
Barnes, David M.	22	STAR Grant	Mercury as an Insulin Mimic: Mechanism of Action and Potential Physiological Consequences	University of Arkansas at Fayetteville	AR - 03
Barr, E. B.	60	STAR Grant	Effects of Inhaled Ultrafine Particles on Asthma	Lovelace Respiratory Research Institute	NM - 01
Barr, Edward B.	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Barrett, Edward G.	58	STAR Grant	Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats	Lovelace Respiratory Research Institute	NM - 01
Bartos, Milan	130	SBIR Phase I	Low Cost Heavy Metals Removal from Hazardous Wastewaters	Lynntech Inc.	TX - 31
Basta, Nicholas T.	35	STAR Grant	Development of Chemical Methods to Assess the Bioavailability of Arsenic in Contaminated Media	Oklahoma State University	OK - 03
Batchelor, Bill	203	Hazardous Substance	Stochastic Risk Assessment for Bioremediation	Texas A & M University	TX - 31
Batchelor, Bill	207	Hazardous Substance	Permanence of Metals Containment in Solidified and Stabilized Wastes	Texas A & M University	TX - 31

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Beland, Frederick A.	178	Hazardous Substance	How Do Chemicals in Diesel Engine Exhaust Damage DNA?	University of Arkansas for Medical Sciences	AR - 02
Beland, Frederick A.	186	Hazardous Substance	Interactive Effects of Nitropyrenes in Diesel Exhaust	Lovelace Respiratory Research Institute	NM - 01
Beland, Frederick A.	190	Hazardous Substance	DNA Mutations in Rats Treated with a Carcinogen Present in Diesel Exhaust	University of Arkansas for Medical Sciences	AR - 02
Belinsky, Steven A.	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Belinsky, Steven A.	189	Hazardous Substance	No Evidence For Genetic Mutations Found In Lung Tumors From Rats Exposed To Diesel Exhaust or Carbon Black	Lovelace Respiratory Research Institute	NM - 01
Beloff, Beth	231	Hazardous Substance	Life-Cycle Environmental Costing for Managing Pollution Prevention in the Chemical and Petroleum Refining Industries: A Cross-Border Approach	University of Texas at Houston	TX - 25
Benninghoff, Abby Diane	113	STAR Fellowship	The Roles of Calcium-dependent Signal Transduction and Environmental Xenobiotic Chemicals in Modulating Ovarian Steroidogenesis in Sciaenids	University of Texas at Austin	TX - 10
Benson, Janet M.	58	STAR Grant	Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats	Lovelace Respiratory Research Institute	NM - 01
Benson, Janet M.	194	Hazardous Substance	Metabolism of Ether Oxygenates Added to Gasoline	Lovelace Respiratory Research Institute	NM - 01
Beron, Kurt	43	STAR Grant	Improving Air Quality Benefit Estimates from Hedonic Models	Louisiana State University - Baton Rouge	LA - 06
Berrens, Robert	10	STAR Grant	Preference Formation and Elicitation in Valuing Non-Market Goods	University of New Mexico - Main Campus	NM - 01
Beyrouty, Craig	177	Hazardous Substance	Using Plants to Remediate Petroleum-Contaminated Soil	University of Arkansas at Fayetteville	AR - 03
Bice, David E.	58	STAR Grant	Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats	Lovelace Respiratory Research Institute	NM - 01

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Bice, David E.	60	STAR Grant	Effects of Inhaled Ultrafine Particles on Asthma	Lovelace Respiratory Research Institute	NM - 01
Blair, Ian A.	192	Hazardous Substance	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites	University of New Orleans	LA - 02
Blake, Diane A.	8	STAR Grant	Quantitation of Heavy Metals by Immunoassay	Tulane University of Louisiana	LA - 02
Bond, James A.	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Bonzongo, Jean-Claude J.	67	STAR Grant	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System	Austin College	TX - 04
Bortun, A. I.	216	Hazardous Substance	Use of Inorganic Ion Exchangers for Hazardous Waste Remediation	Texas A & M University	TX - 31
Boughton, David A.	104	STAR Fellowship	Land Use and Natural Butterfly Populations: Assessing Anthropogenic Effects	University of Texas at Austin	TX - 10
Boutwell, G.	160	Hazardous Substance	Issues Involving the Vertical Expansion of Landfills	University of New Orleans	LA - 02
Boutwell, G.	161	Hazardous Substance	Deep Foundations on Brownfields Sites	University of New Orleans	LA - 02
Bowders, John J.	201	Hazardous Substance	In-Situ Remediation for Contaminated Soils Using Prefabricated Vertical Drains	University of Texas	TX - 10
Brewster, D.	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	University of California - Davis,South Dakota State University,University of Nebraska	
Brooks, Antone L.	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Brookshire, David S.	10	STAR Grant	Preference Formation and Elicitation in Valuing Non-Market Goods	University of New Mexico - Main Campus	NM - 01

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Brookshire, David S.	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	University of New Mexico	NM - 01
Bruno, John G.	149	SBIR Phase I	Hand-Held Fluorometer Using SELEX DNA Aptamer Strip Assays To Detect Cryptosporidium and Encephalitozoon	OmniSite BioDiagnostics Inc.	TX - 10
Bruno, John G.	152	SBIR Phase I	SELEX DNA Aptamer Filter for Removal of Pesticides and Chloroaromatics	OmniSite BioDiagnostics Inc.	TX - 10
Bryan, C. Hobson	67	STAR Grant	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System	University of Alabama - Tuscaloosa	ALABAMA
Bryant, Steven	64	STAR Grant	Theoretical Evaluation of the Interfacial Area between Two Fluids in Soil	University of Texas at Austin	TX - 10
Busbee, David L.	5	STAR Grant	Physiological Effects of Pollutants in the Bottlenose Dolphin	Texas A & M University	TX - 08
Cable, Jaye	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	University of New Mexico	NM - 01
Campana, Michael E.	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	University of New Mexico	NM - 01
Campbell, Lisa	100	STAR Grant	Linking Population and Physiological Diversity in a Toxin-producing Dinoflagellate	Texas A & M University	TX - 31
Caneday, Lowell	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	Oklahoma State University	OK - 03
Carbone, Greg	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	University of South Carolina at Columbia	SOUTH CAROLI
Carpenter, L. V.	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	University of California - Davis,South Dakota State University,University of Nebraska	
Casteel, Stan W.	35	STAR Grant	Development of Chemical Methods to Assess the Bioavailability of Arsenic in Contaminated Media	University of Missouri - Columbia	MISSOURI

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Catalano, Paul	185	Hazardous Substance	Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose	Lovelace Respiratory Research Institute	NM - 01
Catallo, W. James	214	Hazardous Substance	Sonochemical Treatment of Hazardous Organic Compounds II: Process Optimization and Pathway Studies	Louisiana State University	LA - 06
Caton, Jerry	83	STAR Grant	Development of All-Solid-State Sensors for Measurement of Nitric Oxide and Carbon Monoxide Concentrations by Optical Absorption	Texas A & M University	TX - 31
Chang, I-Yiin	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Chapa, Liliana	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	University of Texas at Austin	TX - 10
Chappell, Cynthia L.	13	STAR Grant	Virulence Factors in Cryptosporidium and Infective Dose in Humans	University of Texas Health Science Center-Houston	TX - 25
Chappell, Cynthia L.	76	STAR Grant	Infectivity and Virulence of Cryptosporidium Genotype H Oocysts in Healthy Adult Volunteers	University of Texas Health Science Center-Houston	TX - 25
Chappell, Cynthia L.	92	STAR Grant	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers	University of Texas Health Science Center-Houston?	
Chaubey, Indrajeet	67	STAR Grant	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System	University of Alabama - Tuscaloosa	ALABAMA
Chen, Wilfred	81	STAR Grant	Biosensors for Field Monitoring of Organophosphate Pesticides	University of California - Riverside	CALIFORNIA
Cheng, Yung-Sung	58	STAR Grant	Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats	Lovelace Respiratory Research Institute	NM - 01
Cheng, Yung-Sung	60	STAR Grant	Effects of Inhaled Ultrafine Particles on Asthma	Lovelace Respiratory Research Institute	NM - 01
Cheng, Yung-Sung	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Chermak, Janie	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	University of New Mexico	NM - 01
Cherr, Gary N.	62	STAR Grant	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys	University of California - Davis: Bodega Marine Laboratory	CALIFORNIA
Chick, Thomas W.	181	Hazardous Substance	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	University of New Orleans	LA - 02
Chrzanowski, Thomas H.	44	STAR Grant	Microbial indicators of biological integrity and nutrient stress for aquatic ecosystems	University of Texas at Arlington	TX - 24
Church, Timothy	41	STAR Grant	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure	University of Minnesota	MINNESOTA
Clearfield, Abraham	216	Hazardous Substance	Use of Inorganic Ion Exchangers for Hazardous Waste Remediation	Texas A & M University	TX - 31
Cleveland, Theodore G.	223	Hazardous Substance	A Software Guidance System for Choosing Analytical Subsurface Fate and Transport Models Including a Library of Computer Solutions for the Analytical Models	Texas A & M University	TX - 31
Clifford, Dennis	219	Hazardous Substance	Integrated Process Treatment Train (Bioremediation (Aerobic/Anaerobic} and Immobilization) for Texas Soils Contaminated with Combined Hazardous Wastes	University of Texas	TX - 10
Clifford, Dennis	221	Hazardous Substance	Concentrated Halide Extraction and Recovery of Lead from Soil	Texas A & M University	TX - 31
Clinkenbeard, R.	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	University of Oklahoma Health Sciences Center	OK - 05
Cocke, David L	211	Hazardous Substance	The Binding Chemistry and Leaching Mechanisms of Advanced Solidification/Stabilization Systems for Hazardous Waste Management	Lamar University	TX - 09
Conder, Jason	110	STAR Fellowship	Critical body residues and ion-exchange membranes as measures of heavy metal bioavailability and toxicity in soil	Oklahoma State University	OK - 03
Contreras, Salvador	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Bioconcervacion	MEXICO

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Cooper, Sharon	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	University of Texas at Houston	TX - 25
Corapcioglu, Yavuz	36	STAR Grant	Phytoremediation and Modeling of Land Contaminated by Hydrons	Texas A & M University	TX - 31
Corsi, Richard L.	6	STAR Grant	VOC Emissions from Sewers Process Drains and Drop Structures	University of Texas at Austin	TX - 10
Corsi, Richard L.	72	STAR Grant	Municipal Sewers as Sources of Hazardous Air Pollutants	University of Texas at Austin	TX - 10
Corsi, Richard L.	198	Hazardous Substance	Fugitive Emissions of Hazardous Air Pollutants from On-Site Industrial Sewers	University of Texas	TX - 10
Cothren, Gianna M.	158	Hazardous Substance	Urban Waste Management & Research Center (University of New Orleans)	University of New Orleans	LA - 02
Cothren, Gianna M.	165	Hazardous Substance	UWMRC Community Outreach Multimedia Exhibit	University of New Orleans	LA - 02
Cothren, Gianna M.	167	Hazardous Substance	Investigation of Hydraulic Characteristics and Alternative Model Development of Subsurface Flow Constructed Wetlands	University of New Orleans	LA - 02
Cothren, Gianna M.	168	Hazardous Substance	Beneficial Use Of Urban Runoff For Wetland Enhancement	University of New Orleans	LA - 02
Crawford, Melba	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid	University of Texas at Austin	TX - 10
Cuero, Raul G.	7	STAR Grant	Optimization of Oil Biodegradation by Mixed Bacterial and Fungal Population An Innovative Microbial Delivery System and Oil-Absorbing Natural Material	Prairie View A & M University	TX - 31
Cullen, Brad T.	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	University of New Mexico	NM - 01
Cushing, Alice H.	180	Hazardous Substance	Nitrogen Dioxide and Respiratory Illness in Children	Harvard School of Public Health	MASSACHUSET

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Dagg, Michael	94	STAR Grant	Human Activities and a Changing Climate in Louisiana	Louisiana Universities Marine Consortium	LA - 03
Dale, Bruce E.	205	Hazardous Substance	Optimization of Treatment Technologies for Detoxification of PCB Contaminated Soils	Texas A & M University	TX - 31
Daniel, David E.	201	Hazardous Substance	In-Situ Remediation for Contaminated Soils Using Prefabricated Vertical Drains	University of Texas	TX - 10
Dasgupta, Purnendu K.	29	STAR Grant	Field-Usable Compact Capillary Based Liquid/Ion Chromatographs - Real Time Gas/Aerosol Analyzers	Texas Tech University	TX - 19
Day, John	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	University of New Mexico	NM - 01
Dayawansa, W. P.	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Texas Tech University	TX - 19
de Jesus Navar, Jose	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Universidad Autonoma de Nuevo Leon	MEXICO
Debinski, Diane	20	STAR Grant	Modeling Spatial and Temporal Dynamics of Montane Meadows and Biodiversity in the Greater Yellowstone Ecosystem	Iowa State University	IOWA
Debnath, D.	160	Hazardous Substance	Issues Involving the Vertical Expansion of Landfills	University of New Orleans	LA - 02
Dekant, Wolfgang	194	Hazardous Substance	Metabolism of Ether Oxygenates Added to Gasoline	Lovelace Respiratory Research Institute	NM - 01
del Junco, Deborah	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	University of Texas at Houston	TX - 25
Dellinger, Barry	48	STAR Grant	Investigation of the Elementary Reaction Mechanisms of Fly-Ash Mediated Formation of PCDD/F	Louisiana State University - Baton Rouge	LA - 06
Dellinger, Barry	71	STAR Grant	Ferric Oxide/Alkali Metal Oxide Induced Oxidation of CHCs in Polluted Gas Streams	Louisiana State University - Baton Rouge	LA - 06

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Dellinger, Barry	84	STAR Grant	Toward the Development of a Detailed Mechanism of Transition Metal Catalyzed Formation of PCDD/F from Combustion Generated Hydrocarbons	Louisiana State University - Baton Rouge	LA - 06
Denison, Michael	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	University of Texas at Houston	TX - 25
Denvir, Adrian J.	118	SBIR Phase II	A Novel Method for Converting a Negative Value Waste into a Commodity Chemical	Lynntech Inc.	TX - 31
Denvir, Adrian J.	132	SBIR Phase I	Novel Field Deployable Electrochemical Sensor for the Detection and Long-Term Monitoring of Pollutants	Lynntech Inc.	TX - 31
Denvir, Adrian J.	144	SBIR Phase I	A Novel Method for Converting a Negative Value Waste Into a Commodity Chemical	Lynntech Inc.	TX - 31
Denvir, Adrian J.	148	SBIR Phase I	Novel Method for Ferrate Production	Lynntech Inc.	TX - 31
Denvir, Adrian J.	154	SBIR Phase I	Novel Method for Ferrate Production	Lynntech Inc.	TX - 31
Desvouges, William H.	9	STAR Grant	How People Respond to Contingent Valuation Questions	Research Triangle Park: Triangle Economic Research	NORTH CAROLI
Dickson, Kenneth L.	63	STAR Grant	Environmental Condition On-Line DFW Metroplex (ECOPLEX)	University of North Texas	TX - 26
Dixon, K. R.	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Texas Tech University	TX - 19
Djidjev, Hristo	21	STAR Grant	Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media	Rice University	TX - 18
Dobbs, Richard	230	Hazardous Substance	Stress Protein Responses to Multiple Metal Exposure in Grass Shrimp	Texas A & M University	TX - 31
Donnelly, Kirby C.	34	STAR Grant	Bioavailability & Risk Assessment of Complex Mixtures	Texas A & M University	TX - 31

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Donnelly, Kirby C.	205	Hazardous Substance	Optimization of Treatment Technologies for Detoxification of PCB Contaminated Soils	Texas A & M University	TX - 31
Drew, Malcolm	36	STAR Grant	Phytoremediation and Modeling of Land Contaminated by Hydrons	Texas A & M University	TX - 31
Duncan, Kathleen	172	Hazardous Substance	Passive Sampling Devices (PSDs) for Bioavailability Screening of Soils Containing Petrochemicals	University of Tulsa	OK - 01
DuPont, Herbert L.	13	STAR Grant	Virulence Factors in Cryptosporidium and Infective Dose in Humans	University of Texas Health Science Center-Houston	TX - 25
DuPont, Herbert L.	92	STAR Grant	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers	University of Texas at Houston? (UT - Austin,Texas A & M University)	
Easterling, William	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	Pennsylvania State University - Main Campus	PENNSYLVANIA
Edge, Billy	234	Hazardous Substance	In-Situ Containment and Treatment: Engineering Cap Integrity and Reactivity	Texas A & M University	TX - 31
Edwards, Robert	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Houston Advanced Research Center,Texas A & M University,University of Texas at	TX - 08,TX - 10
Eiceman, Gary A.	57	STAR Grant	A Portable Device for Real-Time Measurement of the Size and Composition of Atmospheric Aerosols	New Mexico State University	NM - 02
Ellington, Rex	12	STAR Grant	Regulation, Business, and Sustainable Development: The Management of Environmentally Conscious Technological Innovation Under Alternative Market Conditions	University of Oklahoma	OK - 04
Elmi, C.	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	University of California - Davis,South Dakota State University,University of Nebraska	
Epperson, William P.	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	South Dakota State University	SOUTH DAKOTA
Erkey, Can	204	Hazardous Substance	Selective Removal of Heavy Metals from Wastewater by Chelation in Supercritical Fluids	Texas A & M University	TX - 31

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Esmen, Nurtan. A.	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	University of Oklahoma Health Sciences Center	OK - 05
Estes, Mary K.	14	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	Baylor College of Medicine	TX - 25
Estes, Mary K.	15	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	Baylor College of Medicine	TX - 25
Everett, J.	47	STAR Grant	The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation	University of Oklahoma	OK - 04
Ewing, Richard E.	21	STAR Grant	Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media	Texas A & M University	TX - 31
Fackler, Jr., John P	80	STAR Grant	Homogeneous Catalysis in Supercritical Carbon Dioxide with Fluoroacrylate Copolymer Supported Catalysts	Texas A & M University	TX - 31
Fang, Xing	17	STAR Grant	Alterations of Water Availability, Water Quality and Fish Habitats in Cold Regions by Climate Change	University of Minnesota	MINNESOTA
Fehrenbacher, L.	28	STAR Grant	Novel Nanocoatings On Cutting Tools For Dry Machining	Technology Assessment & Transfer Inc	MARYLAND
Fitzpatrick, Leigh	237	Hazardous Substance	HSRC Technology Transfer, Training and Outreach	Texas A & M University	TX - 31
Fleeger, J. W.	233	Hazardous Substance	Bioturbation and Bioavailability of Residual, Desorption-Resistant Contaminants	Texas A & M University	TX - 31
Fletcher, John S.	175	Hazardous Substance	Microflora Involved in Phytoremediation of Polyaromatic Hydrocarbons	University of Oklahoma	OK - 04
Focht, Will	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	Oklahoma State University	OK - 03
Ford, Denise Rousseau	237	Hazardous Substance	HSRC Technology Transfer, Training and Outreach	Texas A & M University	TX - 31

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Fort, Douglas J.	150	SBIR Phase I	Development and Preliminary Validation of a Rapid Progestin-Based Endocrine Disruption Screening Assay	Fort Environmental Laboratories Inc.	OK - 03
Fox, Garey A.	107	STAR Fellowship	Image Use in the Characterization of Field Parameters	Texas A & M University	TX - 31
Fox, George E.	31	STAR Grant	Microbial Monitoring With Artificial Stable RNAs	University of Houston	TX - 18
Frame, Lynn	25	STAR Grant	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer	University of Arkansas for Medical Sciences	AR - 02
Frampton, Mark W.	191	Hazardous Substance	A Pilot Study of Potential Biomarkers of Ozone Exposure	Lovelace Respiratory Research Institute	NM - 01
Frost, Floyd	99	STAR Grant	Evaluating Microbial Indicators and Health Risks Associated with Bank Filtration	Lovelace Clinic Foundation	NM - 01
Fry, Brian	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	University of New Mexico	NM - 01
Fuiman, L. A.	68	STAR Grant	Evaluation of Endocrine-Distrupting Chemical Effects Across Multiple Levels of Biological Organization: Integration of Physiology Behavior and Population Dynamics In Fishes	University of Texas at Austin	TX - 10
Fullerton, Don	11	STAR Grant	A Framework to Compare Polices for Source Reduction	University of Texas at Austin	TX - 10
Ganderton, Philip	10	STAR Grant	Preference Formation and Elicitation in Valuing Non-Market Goods	University of New Mexico - Main Campus	NM - 01
Garrison, Timothy J.	215	Hazardous Substance	Laser Diagnostics of the Combustion Process within a Rotary Kiln Incinerator	Louisiana State University	LA - 06
Gelzleichter, Thomas R.	182	Hazardous Substance	Effects of Prolonged Ozone Inhalation on Collagen Structure and Content in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Georgiou, George	1	STAR Grant	NMR Imaging of Biofilm Growth in Porous Media	University of Texas at Austin	TX - 10

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Georgiou, George	197	Hazardous Substance	Hollow Fiber Membrane Bioreactors for Treating Water and Air Streams Contaminated with Chlorinated Solvents	University of Texas	TX - 10
Gerde, Per	193	Hazardous Substance	Penetration of Lung Lining and Clearance of Particles Containing Benzo[a]pyrene	Lovelace Respiratory Research Institute	NM - 01
Gibson, Aaron	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	University of Oklahoma Health Sciences Center,University of Oklahoma	OK - 04,OK - 06
Gilbert, Kathleen M.	55	STAR Grant	Mechanism(s) of Chloroethylene-Induced Autoimmunity	University of Arkansas for Medical Sciences	AR - 02,AR - 03
Gilbert, Robert B.	200	Hazardous Substance	A Risk-Based Decision Analysis Approach for Aquifers Contaminated with DNAPLs	University of Texas	TX - 10
Gillett, Nancy A.	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Gladkikh, Mikhail	64	STAR Grant	Theoretical Evaluation of the Interfacial Area between Two Fluids in Soil	University of Texas at Austin	TX - 10
Goedecke, George	2	STAR Grant	Radiation Scattering by Fractal Clusters in Aerosols	New Mexico State University	NM - 02
Gold, John R.	100	STAR Grant	Linking Population and Physiological Diversity in a Toxin-producing Dinoflagellate	Texas A & M University	TX - 31
Gonzales-Ramos, Javier	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid	University of Texas at Brownsville	TX - 27
Gonzalez-Ayala, Salvador	74	STAR Grant	Paso del Norte Environmental Monitor	Instituto Municipal de Investigacion y Planeacion	MEXICO
Gourdine, Meredith C.	121	SBIR Phase I	Multi- Vortex System for Recovering Volatile Organic Contaminants from Industrial Gas	Energy Innovations Inc.	TX-07
Grace, James	89	STAR Grant	Chinese Tallow Invasions into the Endangered Coastal Prairie: Causes and Consequences	Rice University	TX - 18

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Grant, Stanley B.	14	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	University of California - Irvine	CALIFORNIA
Grant, Stanley B.	15	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	University of California - Irvine	CALIFORNIA
Gray, Robert	74	STAR Grant	Paso del Norte Environmental Monitor	University of Texas at El Paso	TX - 16
Greaves, Ian	41	STAR Grant	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure	University of Minnesota	MINNESOTA
Gregory, Kirk	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	University of New Mexico	NM - 01
Griffith, William C.	179	Hazardous Substance	Does Ozone Cause Precancerous Changes in Cells?	Lovelace Respiratory Research Institute	NM - 01
Griffith, William C.	185	Hazardous Substance	Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose	Lovelace Respiratory Research Institute	NM - 01
Griffith, William C.	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Gross, Elizabeth A.	185	Hazardous Substance	Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose	Lovelace Respiratory Research Institute	NM - 01
Grotelueschen, Dale M.	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	University of Nebraska at Lincoln	NEBRASKA
Grover, James P	44	STAR Grant	Microbial indicators of biological integrity and nutrient stress for aquatic ecosystems	University of Texas at Arlington	TX - 24
Hall, Matthew J.	217	Hazardous Substance	Kaolinite Sorbent for the Removal of Heavy Metals from Incinerated Lubricating Oils	University of Texas	TX - 10
Hall, Thomas. A.	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	University of Oklahoma Health Sciences Center	OK - 05

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Hannoura, A. P.	168	Hazardous Substance	Beneficial Use Of Urban Runoff For Wetland Enhancement	University of New Orleans	LA - 02
Hansen, Lara	62	STAR Grant	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys	US EPA NHEERL: Gulf Breeze, FL	FLORIDA
Harkema, Jack	179	Hazardous Substance	Does Ozone Cause Precancerous Changes in Cells?	Lovelace Respiratory Research Institute	NM - 01
Harkema, Jack	182	Hazardous Substance	Effects of Prolonged Ozone Inhalation on Collagen Structure and Content in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Harkema, Jack	184	Hazardous Substance	Pulmonary Function Alterations in Rats After Chronic Ozone Inhalation	Lovelace Respiratory Research Institute	NM - 01
Harkema, Jack	185	Hazardous Substance	Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose	Lovelace Respiratory Research Institute	NM - 01
Harris, Thomas M.	173	Hazardous Substance	Demonstration of a Subsurface Drainage System for the Remediation of Brine-Impacted Soil	University of Tulsa	OK - 01
Hasegawa, Mark	176	Hazardous Substance	Microbial Treatment of Naturally Occurring Radioactive Material (NORM)	University of Oklahoma	OK - 04
Hawk, Susan	182	Hazardous Substance	Effects of Prolonged Ozone Inhalation on Collagen Structure and Content in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Hayes, Donald J.	146	SBIR Phase I	PheroJet Traps for Areawide Integrated Pest Management	MicroFab Technologies Inc.	TX - 03
Hazelton, Jared	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Texas A & M University	TX - 31
Heller, Miriam	202	Hazardous Substance	Membrane Technology Selection System for the Metal Finishing Industry	Texas A & M University	TX - 31
Heller, Miriam	231	Hazardous Substance	Life-Cycle Environmental Costing for Managing Pollution Prevention in the Chemical and Petroleum Refining Industries: A Cross-Border Approach	University of Texas at Houston	TX - 25

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Henderson, Rogene F.	53	STAR Grant	Biological Markers of Exposure to Benzene	Lovelace Respiratory Research Institute	NM - 01
Henderson, Rogene F.	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Henderson, Rogene F.	192	Hazardous Substance	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites	University of New Orleans	LA - 02
Hinton, David E.	26	STAR Grant	An in vivo Model for Detection of Reproductive Effects of Endocrine Disruptors	University of California - Davis	CALIFORNIA
Hitchens, G. Duncan	142	SBIR Phase I	Novel Polymers With Immobilized Antimicrobial Enzymes for Disinfection	Lynntech Inc.	TX - 31
Ho, T. C.	195	Hazardous Substance	Gulf Coast Hazardous Substance Research Center (Lamar University)	Gulf Coast Hazardous Research Center	TX - 09
Ho, Thomas C.	225	Hazardous Substance	Sorbent Technology for Multipollutant Control During Fluidized Bed Incineration	Lamar University	TX - 09
Hoar, Bruce	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	University of California - Davis	CALIFORNIA
Hodko, Dalibor	119	SBIR Phase II	A New Microfluidic System for the Determination of Cryptosporidium Oocysts in Water	Lynntech Inc.	TX - 31
Hodko, Dalibor	145	SBIR Phase I	A New Microfluidic System for the Determination of Cryptosporidium Oocysts in Water	Lynntech Inc.	TX - 31
Holian, Andrij	59	STAR Grant	Airborne Particulate Matter-Induced Lung Inflammation	University of Texas at Houston	TX - 25
Holtzapple, Mark	209	Hazardous Substance	A Process To Convert Industrial Biosludge and Paper Fines to Mixed Alcohol Fuels	Texas A & M University	TX - 31
Hong, Jun-Yan	194	Hazardous Substance	Metabolism of Ether Oxygenates Added to Gasoline	Lovelace Respiratory Research Institute	NM - 01

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Hopper, Jack R.	196	Hazardous Substance	Field Study Abstract: A Model of Ambient Air Pollution in Southeast Texas Using Artificial Neural Network Technology	Lamar University	TX - 09
Hopper, Jack R.	227	Hazardous Substance	Pollution Prevention by Process Modification	Lamar University	TX - 09
Hosea, James Michael	141	SBIR Phase I	Reclamation of Soils and Soil Leachates Contaminated with Heavy Metals	Bio-Recovery Systems Inc.	NM - 02
Hovde, David Christian	135	SBIR Phase I	Compact, Continuous Monitoring for Volatile Organic Compounds	Southwest Sciences Inc.	NM - 03
Hovde, David Christian	139	SBIR Phase I	Portable Methane Flux Meter	Southwest Sciences Inc.	NM - 03
Howard, Cynthia L.	230	Hazardous Substance	Stress Protein Responses to Multiple Metal Exposure in Grass Shrimp	Texas A & M University	TX - 31
Howard, Paul C.	186	Hazardous Substance	Interactive Effects of Nitropyrenes in Diesel Exhaust	Lovelace Respiratory Research Institute	NM - 01
Hoyle, Albert G.	120	SBIR Phase I	Recycling of Polypropylene Carpet Waste into Polyester Carpet Backcoating	Hoyle Associates	MASSACHUSET
Hrncir, Duane	56	STAR Grant	Photochemical Processes Controlling Manganese Chemistry in Pristine and Contaminated Mountain Streams	Mesa State College	COLORADO
Hughes, Joe	234	Hazardous Substance	In-Situ Containment and Treatment: Engineering Cap Integrity and Reactivity	Texas A & M University	TX - 31
Hunt, William C.	180	Hazardous Substance	Nitrogen Dioxide and Respiratory Illness in Children	Harvard School of Public Health	MASSACHUSET
Jakubauskas, Mark	20	STAR Grant	Modeling Spatial and Temporal Dynamics of Montane Meadows and Biodiversity in the Greater Yellowstone Ecosystem	University of Kansas Main Campus	KANSAS
James, David S.	181	Hazardous Substance	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	University of New Orleans	LA - 02

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Janecki, Andrzej	92	STAR Grant	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers	University of Texas Medical School at Houston	TX - 25
Janz, David M.	52	STAR Grant	Ecotoxicity Risks Associated with the Land Treatment of Petrochemical Wastes	Oklahoma State University	OK - 03
Jeffries, Rhonda	73	STAR Grant	The Tulsa Air and Water Quality Information System	Oklahoma Department of Environmental Quality	OK - 01
Jenkins, Hank	10	STAR Grant	Preference Formation and Elicitation in Valuing Non-Market Goods	University of New Mexico - Main Campus	NM - 01
Johnson, Anna	64	STAR Grant	Theoretical Evaluation of the Interfacial Area between Two Fluids in Soil	University of Texas at Austin	TX - 10
Johnson, David. L.	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	University of Oklahoma Health Sciences Center	OK - 05
Johnston, Murray V.	57	STAR Grant	A Portable Device for Real-Time Measurement of the Size and Composition of Atmospheric Aerosols	University of Delaware	DELAWARE
Jordan, Donald L.	229	Hazardous Substance	Transferring Technical Information on Hazardous Substance Research by Publishing on the World Wide Web	Lamar University	TX - 09
Josse, Juan	159	Hazardous Substance	Comprehensive Evaluation of The Dual Trickling Filter Solids Contact Process	University of New Orleans	LA - 02
Judd, Frank	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid	University of Texas - Pan American	TX - 15
Junk, Thomas	214	Hazardous Substance	Sonochemical Treatment of Hazardous Organic Compounds II: Process Optimization and Pathway Studies	Louisiana State University	LA - 06
Justic, Dubravko	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	University of New Mexico	NM - 01
Kadlubar, Fred	25	STAR Grant	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer	National Center for Toxicology Research	AR - 02

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Kaplan, Hillard	10	STAR Grant	Preference Formation and Elicitation in Valuing Non-Market Goods	University of New Mexico - Main Campus	NM - 01
Katz, Richard	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	National Center for Atmospheric Research	COLORADO
Kemp, Paul	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	University of New Mexico	NM - 01
Kenimer, Ann L.	66	STAR Grant	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning	Texas A & M University	TX - 31
Kennedy, James H.	63	STAR Grant	Environmental Condition On-Line DFW Metroplex (ECOPLEX)	University of North Texas	TX - 26
Kennicutt, Mahlon C.	32	STAR Grant	Developing a New Monitoring Tool for Benthic Organisms in the Gulf of Mexico: Loss of Genetic Variability in Meiofaunal Populations	Texas A&M University	TX - 31
Kennicutt, Mahlon C.	37	STAR Grant	Intrinsic Stable Isotopic Tracers of Environmental Contaminants	Texas A & M University	TX - 31
Khachatryan, Lavrent	48	STAR Grant	Investigation of the Elementary Reaction Mechanisms of Fly-Ash Mediated Formation of PCDD/F	Louisiana State University - Baton Rouge	LA - 06
Khachatryan, Lavrent	71	STAR Grant	Ferric Oxide/Alkali Metal Oxide Induced Oxidation of CHCs in Polluted Gas Streams	Louisiana State University - Baton Rouge	LA - 06
Kibbey, Tohren C. G.	90	STAR Grant	The Influence of Amphiphilic Molecules on the Environmental Fate and Transport of Pharmaceuticals	University of Oklahoma	OK - 04
Kindscher, Kelly	20	STAR Grant	Modeling Spatial and Temporal Dynamics of Montane Meadows and Biodiversity in the Greater Yellowstone Ecosystem	University of Kansas Main Campus	KANSAS
Kinney, Kerry A.	49	STAR Grant	Innovations in Vapor Phase Bioreactor Design	University of Texas at Austin	TX - 10
Kitz, Hilary	73	STAR Grant	The Tulsa Air and Water Quality Information System	City of Tulsa, Oklahoma	OK - 01

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Klerks, Paul	95	STAR Grant	How likely is it that fish populations will successfully adapt to global warming?	University of Louisiana at Lafayette	LA - 07
Klerks, Paul	96	STAR Grant	Saltwater intrusion on the gulf coast: an assessment of the interactions of salinity stress, genetic diversity and population characteristics of fish inhabiting coastal marshes	University of Louisiana at Lafayette	LA - 07
Knox, Robert	47	STAR Grant	The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation	University of Oklahoma	OK - 04
Komanduri, Ranga	28	STAR Grant	Novel Nanocoatings On Cutting Tools For Dry Machining	Oklahoma State University - Main Campus	OK - 03
Kooshian, Charles	74	STAR Grant	Paso del Norte Environmental Monitor	City of El Paso, Texas	TX - 16
Koppelman, David	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	Louisiana State University - Baton Rouge	LA - 06
Krause, Kate	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	University of New Mexico	NM - 01
Krause, Wendy E.	151	SBIR Phase I	A Universal Technique for Antimicrobial Surface Preparation Using Quaternary Ammonium-Functionalized Dendrimers	Lynntech Inc.	TX - 31
Kroh, Franklin O.	131	SBIR Phase I	Silica Materials for Mercury Recovery From Wastewater	TPL Inc.	NM - 01
Krumholz, Lee R.	176	Hazardous Substance	Microbial Treatment of Naturally Occurring Radioactive Material (NORM)	University of Oklahoma	OK - 04
Kuder, T.	51	STAR Grant	Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment	University of Oklahoma	OK - 04
Kuder, Tomasz	51	STAR Grant	Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment	University of Oklahoma	OK - 04
Kunde, Twila	99	STAR Grant	Evaluating Microbial Indicators and Health Risks Associated with Bank Filtration	Lovelace Clinic Foundation	NM - 01

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Kura, Bhaskar	158	Hazardous Substance	Urban Waste Management & Research Center (University of New Orleans)	University of New Orleans	LA - 02
Kura, Bhaskar	162	Hazardous Substance	Ambient Particulate Concentration Model for Traffic Intersections	University of New Orleans	LA - 02
Kurlkin, Joanne	73	STAR Grant	The Tulsa Air and Water Quality Information System	City of Tulsa,Indian Nations Council of Government,Oklahoma Department of Environmental	OK - 01
Kustas, Frank	28	STAR Grant	Novel Nanocoatings On Cutting Tools For Dry Machining	Technology Assessment & Transfer Inc	MARYLAND
La Motta, Enrique J.	159	Hazardous Substance	Comprehensive Evaluation of The Dual Trickling Filter Solids Contact Process	University of New Orleans	LA - 02
Lahsen, Myanna	102	STAR Fellowship	Culture, Science and Uncertainty: Conflicting Positions on Climate Change	Rice University	TX - 18
Lalor, Melinda Marsh	166	Hazardous Substance	Including New Technology into the Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems - A User's Guide	University of New Orleans	LA - 02
Lambert, William E.	180	Hazardous Substance	Nitrogen Dioxide and Respiratory Illness in Children	Harvard School of Public Health	MASSACHUSET
Lambert, William E.	181	Hazardous Substance	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	University of New Orleans	LA - 02
Lambert, William L.	180	Hazardous Substance	Nitrogen Dioxide and Respiratory Illness in Children	Harvard School of Public Health	MASSACHUSET
LaMotta, Enrique	158	Hazardous Substance	Urban Waste Management & Research Center (University of New Orleans)	University of New Orleans	LA - 02
Lang, Nicholas P	25	STAR Grant	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer	University of Arkansas for Medical Sciences	AR - 02
Langford, Richard P	91	STAR Grant	Riverbank Filtration Effectiveness in an Arid Environment	University of Texas at Austin	TX - 10

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Lanno, Roman	172	Hazardous Substance	Passive Sampling Devices (PSDs) for Bioavailability Screening of Soils Containing Petrochemicals	Oklahoma State University	OK - 03
Last, Jerold A.	182	Hazardous Substance	Effects of Prolonged Ozone Inhalation on Collagen Structure and Content in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Lazarov, Raytcho D.	21	STAR Grant	Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media	Texas A & M University	TX - 31
Leberg, Paul. L.	95	STAR Grant	How likely is it that fish populations will successfully adapt to global warming?	University of Louisiana at Lafayette	LA - 07
Leberg, Paul. L.	96	STAR Grant	Saltwater intrusion on the gulf coast: an assessment of the interactions of salinity stress, genetic diversity and population characteristics of fish inhabiting coastal marshes	University of Louisiana at Lafayette	LA - 07
Lee, William R.	39	STAR Grant	Improved Risk Assessment with an Intragenic Mutation Assay	Louisiana State University - Baton Rouge	LA - 06
Li, Chao-Jun	3	STAR Grant	Water as Solvent for Metal-Mediated Carbon-Carbon Bond Formations	Tulane University of Louisiana	LA - 02
Li, Chao-Jun	79	STAR Grant	Forming Carbon-Carbon Bonds in Water and Other Alternative Media	Tulane University of Louisiana	LA - 02
Li, Ku-Yen	212	Hazardous Substance	Development of an Air-Stripping and UV/H2O2 Oxidation Integrated Process To Treat a Chloro-Hydrocarbon-Contaminated Ground Water	Lamar University	TX - 09
Li, Ku-Yen	224	Hazardous Substance	Measurement of Oxygen Transfer Rate in Soil Matrices	Lamar University	TX - 09
Liu, Jing	40	STAR Grant	Age and Interactive Toxicity of Organophosphorus Insecticides	Northeast Louisiana University	LA - 05
Liu, Qing-Huo	23	STAR Grant	Geophysical Sensing in Environmental Applications: Efficient Numerical Simulations	New Mexico State University	NM - 02
Lochmiller, Robert L.	52	STAR Grant	Ecotoxicity Risks Associated with the Land Treatment of Petrochemical Wastes	Oklahoma State University	OK - 03

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Loehr, Raymond C.	199	Hazardous Substance	Biofiltration Technology Development	University of Texas	TX - 10
Lomnicki, Slawomir	71	STAR Grant	Ferric Oxide/Alkali Metal Oxide Induced Oxidation of CHCs in Polluted Gas Streams	Louisiana State University - Baton Rouge	LA - 06
Lonard, Robert	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid	University of Texas - Pan American	TX - 15
Lucht, Robert P.	83	STAR Grant	Development of All-Solid-State Sensors for Measurement of Nitric Oxide and Carbon Monoxide Concentrations by Optical Absorption	Texas A & M University	TX - 31
Lynch, R. A.	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	University of Oklahoma	OK - 04
Lynch, Robert A.	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	University of Oklahoma Health Sciences Center	OK - 05
Lyons, W. Berry	67	STAR Grant	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System	University of Alabama - Tuscaloosa	ALABAMA
Mace, Kimberly A.	112	STAR Fellowship	Atmospheric Organic Nitrogen - Origin, Speciation, and Significance in Global Marine Biogeochemistry	Texas A & M University	TX - 31
Macko, Stephen A.	37	STAR Grant	Intrinsic Stable Isotopic Tracers of Environmental Contaminants	University of Virginia	VIRGINIA
MacLeod, Stewart	25	STAR Grant	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer	University of Arkansas for Medical Sciences,National Center for Toxicology Research	AR - 02, AR - 04
Majors, Paul D.	1	STAR Grant	NMR Imaging of Biofilm Growth in Porous Media	University of Texas at Austin	TX - 10
Marbury, M.	24	STAR Grant	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area	Minnesota Department of Health	MINNESOTA
Marcham, Cheri	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	University of Oklahoma Health Sciences Center	OK - 05

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Marshall, Paul	82	STAR Grant	Oxidative Transformation of Model Oxygenated Hazardous Air Pollutants	University of North Texas	TX - 26
Martin, C. F.	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Texas Tech University	TX - 19
Martin, Howard	63	STAR Grant	Environmental Condition On-Line DFW Metroplex (ECOPLEX)	City of Denton, Texas	TX - 26
Mathis, Mitchell	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	University of Texas: Houston Advanced Research Center - Woodlands	TX - 08
Matlock, Marty D.	66	STAR Grant	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning	Texas A & M University	TX - 31
Matthews, Olen Paul	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	University of New Mexico	NM - 01
Mauderly, Joe L.	184	Hazardous Substance	Pulmonary Function Alterations in Rats After Chronic Ozone Inhalation	Lovelace Respiratory Research Institute	NM - 01
Mauderly, Joe L.	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Mauderly, Joe L.	188	Hazardous Substance	An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust	Lovelace Respiratory Research Institute	NM - 01
Mayer, Alex A.	33	STAR Grant	A Multi-Scale Investigation of Mass Transfer Limitations in Surfactant-Enhanced Aquifer Remediation	Michigan Technological University	MICHIGAN
McCarl, Bruce	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	Texas A & M University	TX - 31
McCluskey, B. J.	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	University of California - Davis,South Dakota State University,University of Nebraska	
McCool, F. Dennis	181	Hazardous Substance	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	University of New Orleans	LA - 02

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
McCorquodale, J. A.	158	Hazardous Substance	Urban Waste Management & Research Center (University of New Orleans)	University of New Orleans	LA - 02
McCorquodale, J. A.	169	Hazardous Substance	Urban Storm and Waste Water Outfall Modeling	University of New Orleans	LA - 02
McDonald, T J.	34	STAR Grant	Bioavailability & Risk Assessment of Complex Mixtures	Texas A & M University	TX - 31
Mclnerney, Michael	156	Early Competed Center	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics	University of Oklahoma	OK - 04
McKee, Michael	10	STAR Grant	Preference Formation and Elicitation in Valuing Non-Market Goods	University of New Mexico - Main Campus	NM - 01
McKinney, Daene C.	200	Hazardous Substance	A Risk-Based Decision Analysis Approach for Aquifers Contaminated with DNAPLs	University of Texas	TX - 10
McKnight, Diane M.	56	STAR Grant	Photochemical Processes Controlling Manganese Chemistry in Pristine and Contaminated Mountain Streams	University of Colorado at Boulder	COLORADO
McLaren, Leroy C.	180	Hazardous Substance	Nitrogen Dioxide and Respiratory Illness in Children	Harvard School of Public Health	MASSACHUSET
McManis, Kenneth	158	Hazardous Substance	Urban Waste Management & Research Center (University of New Orleans)	University of New Orleans	LA - 02
McManis, Kenneth	160	Hazardous Substance	Issues Involving the Vertical Expansion of Landfills	University of New Orleans	LA - 02
McManis, Kenneth	161	Hazardous Substance	Deep Foundations on Brownfields Sites	University of New Orleans	LA - 02
McMurry, Scott T.	54	STAR Grant	Exposure and Response of Morelet's Crocodile (Crocodylus moreletii) Populations to Endocrine Disrupting Compounds in Belize, Central America	Texas Tech University	TX - 19
McMurry, Scott T.	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Texas Tech University	TX - 19

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Mearns, Linda	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	National Center for Atmospheric Research	COLORADO
Meister, John J.	88	STAR Grant	Fundamental Studies of Wood Interface Modification for Formaldehyde Pollution Avoidance and Prevention	Forest Products Research Center	NM - 01
Menache, Margaret	53	STAR Grant	Biological Markers of Exposure to Benzene	Lovelace Respiratory Research Institute	NM - 01
Meo, Mark	12	STAR Grant	Regulation, Business, and Sustainable Development: The Management of Environmentally Conscious Technological Innovation Under Alternative Market Conditions	University of Oklahoma	OK - 04
Meo, Mark	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	University of Oklahoma	OK - 04
Mermier, Christine M.	181	Hazardous Substance	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	University of New Orleans	LA - 02
Miller, Gregory P.	155	SBIR Phase I	Subsurface Treatment for Arsenic Removal	Daniel B. Stephens and Associates Inc.	NM - 01
Minevski, Zoran	117	SBIR Phase II	New Environmentally Benign Heteropolymolybdate Conversion Coatings for Aluminum Alloys	Lynntech Inc.	TX - 31
Minevski, Zoran	134	SBIR Phase I	New Environmentally Benign Heteropolymolybdate Conversion Coatings for Aluminum Alloys	Lynntech Inc.	TX - 31
Mitchell, Charles	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Mitchell, Charles	189	Hazardous Substance	No Evidence For Genetic Mutations Found In Lung Tumors From Rats Exposed To Diesel Exhaust or Carbon Black	Lovelace Respiratory Research Institute	NM - 01
Mittleman, Daniel M.	65	STAR Grant	Development of a New Gas Sensing System Based on Terahertz Time-Domain Spectroscopy	Rice University	TX - 18
Mohanty, Kishore K.	222	Hazardous Substance	Biodegradable Surfactant for Underground Chlorinated Solvent Remediation	Texas A & M University	TX - 31

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Montagna, Paul A.	32	STAR Grant	Developing a New Monitoring Tool for Benthic Organisms in the Gulf of Mexico: Loss of Genetic Variability in Meiofaunal Populations	University of Texas at Austin	TX - 10
Morandi, Maria T.	59	STAR Grant	Airborne Particulate Matter-Induced Lung Inflammation	University of Texas at Houston	TX - 25
Morgan, Kevin T.	185	Hazardous Substance	Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose	Lovelace Respiratory Research Institute	NM - 01
Moss, S. K.	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	University of Oklahoma Health Sciences Center,University of Oklahoma	OK - 04,OK - 06
Mueller, Erich	62	STAR Grant	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys	NERL and NHEERL, OW - OCPD, Region 4 and 6(Gulf of Mexico Progr	
Mulchandani, Ashok	81	STAR Grant	Biosensors for Field Monitoring of Organophosphate Pesticides	University of California - Riverside	CALIFORNIA
Munster, Clyde	36	STAR Grant	Phytoremediation and Modeling of Land Contaminated by Hydrons	Texas A & M University	TX - 31
Murdoch, James C.	43	STAR Grant	Improving Air Quality Benefit Estimates from Hedonic Models	Louisiana State University - Baton Rouge	LA - 06
Murphy, Cynthia F.	85	STAR Grant	Development of Life Cycle Inventory Modules for Semiconductor Processing	University of Texas at Austin	TX - 10
Murphy, Oliver J.	122	SBIR Phase I	Improved Method for Heating Catalytic Converters of Vehicles to Attain Ultra-Low Emissions	Lynntech Inc.	TX - 31
Murphy, Oliver J.	123	SBIR Phase II	Improved Method of Heating Catalytic Converters of Vehicles to Attain Ultra-Low Emissions	Lynntech Inc.	TX - 31
Nagle, David P.	175	Hazardous Substance	Microflora Involved in Phytoremediation of Polyaromatic Hydrocarbons	University of Oklahoma	OK - 04
Nataraj, Mysore	160	Hazardous Substance	Issues Involving the Vertical Expansion of Landfills	University of New Orleans	LA - 02

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Nataraj, Mysore	161	Hazardous Substance	Deep Foundations on Brownfields Sites	University of New Orleans	LA - 02
Neill, William H.	66	STAR Grant	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning	Texas A & M University	TX - 31
Neuenschwander, Amy	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid	University of Texas at Austin	TX - 10
Neupauer, Roseanna M.	106	STAR Fellowship	Environmental transport modeling	New Mexico Institute of Mining and Technology	NM - 02
Nikula, K. J.	60	STAR Grant	Effects of Inhaled Ultrafine Particles on Asthma	Lovelace Respiratory Research Institute	NM - 01
Nikula, K. J.	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Nikula, K. J.	189	Hazardous Substance	No Evidence For Genetic Mutations Found In Lung Tumors From Rats Exposed To Diesel Exhaust or Carbon Black	Lovelace Respiratory Research Institute	NM - 01
Nimitz, Jonathan S.	116	SBIR Phase II	High-Performance, Low-Global-Warming Refrigerants for Domestic Refrigerators	Environmental Technology and Education Center Inc.	NM - 01
Nimitz, Jonathan S.	136	SBIR Phase I	High-Performance, Low-Global-Warming Refrigerant for Domestic Refrigerators	Environmental Technology and Education Center Inc.	NM - 01
Nimitz, Jonathan S.	147	SBIR Phase I	High Performance, Zero ODP Halon 1301 Replacement	Nimitz Inc.	NM - 01
Noble, Beth	64	STAR Grant	Theoretical Evaluation of the Interfacial Area between Two Fluids in Soil	University of Texas at Austin	TX - 10
Nyman, J. A.	168	Hazardous Substance	Beneficial Use Of Urban Runoff For Wetland Enhancement	University of New Orleans	LA - 02
Ogunseiten, Oladele	14	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	University of California - Irvine	CALIFORNIA

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Ogunseiten, Oladele	15	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	University of California - Irvine	CALIFORNIA
Okhuysen, Pablo C.	13	STAR Grant	Virulence Factors in Cryptosporidium and Infective Dose in Humans	University of Texas Health Science Center-Houston	TX - 25
Okhuysen, Pablo C.	76	STAR Grant	Infectivity and Virulence of Cryptosporidium Genotype H Oocysts in Healthy Adult Volunteers	University of Texas Health Science Center-Houston	TX - 25
Okhuysen, Pablo C.	92	STAR Grant	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers	University of Texas at Austin	TX - 10
Olson, Terese M.	14	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	University of California - Irvine	CALIFORNIA
Olson, Terese M.	15	STAR Grant	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection	University of California - Irvine	CALIFORNIA
Paek, Domyung	181	Hazardous Substance	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	University of New Orleans	LA - 02
Pardue, J.	233	Hazardous Substance	Bioturbation and Bioavailability of Residual, Desorption-Resistant Contaminants	Texas A & M University	TX - 31
Pardue, J.	235	Hazardous Substance	Phytoremediation in wetlands and CDFs	Louisiana State University - Baton Rouge	LA - 06
Parsley, Edwin	59	STAR Grant	Airborne Particulate Matter-Induced Lung Inflammation	University of Texas at Houston	TX - 25
Patton, Charles C.	128	SBIR Phase I	Treatment of Produced Water from Coal-Bed Methane Production Using Carbon Aerogel Technology	BPF Inc.	TX - 32
Paull, Gene	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid	University of Texas at Brownsville	TX - 27
Payne, John W.	9	STAR Grant	How People Respond to Contingent Valuation Questions	Duke University	NORTH CAROLI

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Pearson, Roderick R.	111	STAR Fellowship	An Enhanced Aerosol Size Distribution Methodology	University of Texas at El Paso	TX - 16
Peterson, Tarla Rai	66	STAR Grant	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning	Texas A & M University	TX - 31
Phillips, Margaret L.	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	University of Oklahoma Health Sciences Center	OK - 05
Philp, R. Paul	51	STAR Grant	Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment	University of Oklahoma	OK - 04
Pike, Ralph W.	226	Hazardous Substance	Pollution Prevention by Process Modification Using On-Line Optimization	Louisiana State University	LA - 06
Pillai, Surresh	18	STAR Grant	Reversible Inactivation of Viruses in Groundwater	Texas A&M Agricultural Research and Extension Center	TX - 31
Pillai, Surresh	91	STAR Grant	Riverbank Filtration Effectiveness in an Arid Environment	Texas A & M University	TX - 31
Pinc, Gaylon	73	STAR Grant	The Tulsa Air and Water Quality Information System	Indian Nations Council of Government	OK - 01
Pinckney, James L.	93	STAR Grant	Gymnodinium breve in the Gulf of Mexico: Gyroxanthin-based Estimates of Carbon-Specific Growth Rates Under Varying Environmental Conditions	Texas A & M University	TX - 31
Pitt, Robert E.	166	Hazardous Substance	Including New Technology into the Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems - A User's Guide	University of New Orleans	LA - 02
Pope, Carey	40	STAR Grant	Age and Interactive Toxicity of Organophosphorus Insecticides	Oklahoma State University	OK - 03
Pope, Gary A.	33	STAR Grant	A Multi-Scale Investigation of Mass Transfer Limitations in Surfactant-Enhanced Aquifer Remediation	University of Texas at Austin	TX - 10
Potter, William	73	STAR Grant	The Tulsa Air and Water Quality Information System	City of Tulsa,Indian Nations Council of Government,Oklahoma Department of Environmental	OK - 01

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Powell, Quint H.	58	STAR Grant	Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats	Lovelace Respiratory Research Institute	NM - 01
Power, James H.	30	STAR Grant	Spatial and Temporal Patterns of Larval Fish Morphometrics as Indicators of Ecosystem Health	Louisiana State University - Baton Rouge	LA - 06
Pratt, Greg	24	STAR Grant	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area	Minnesota Pollution Control Agency	MINNESOTA
Prengle, H. W.	220	Hazardous Substance	Photo-Oxidation by H2O2/VisUV of Off-Gas Atmospheric Emissions from Industrial and Environmental Remediation Sources	Texas A & M University	TX - 31
Presley, Richard	101	STAR Fellowship	Reductive Dehalogenation at Electrodes	New Mexico Highlands University	NM - 03
Pressman, Jonathan G.	105	STAR Fellowship	Development and Demonstration of a Hollow Fiber Membrane Bioreactor for Cometabolic Degradation of Chlorinated Solvents	University of Texas at Austin	TX - 10
Pryor, William A.	191	Hazardous Substance	A Pilot Study of Potential Biomarkers of Ozone Exposure	Lovelace Respiratory Research Institute	NM - 01
Pumford, Neil R.	55	STAR Grant	Mechanism(s) of Chloroethylene-Induced Autoimmunity	University of Arkansas for Medical Sciences,University of Arkansas at Fayetteville	AR - 02,AR - 03
Purser, Jane	73	STAR Grant	The Tulsa Air and Water Quality Information System	City of Tulsa,Indian Nations Council of Government,Oklahoma Department of Environmental	OK - 01
Putnam, Kim L.	188	Hazardous Substance	An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust	Lovelace Respiratory Research Institute	NM - 01
Qualls, Charles W.	52	STAR Grant	Ecotoxicity Risks Associated with the Land Treatment of Petrochemical Wastes	Oklahoma State University	OK - 03
Radhakrishnamurthy, Bhan	183	Hazardous Substance	Changes in Complex Carbohydrate Content and Structure in Rat Lungs Caused by Prolonged Ozone Inhalation	Tulane University of Louisiana	LA - 02
Rajagopalan, Raj	222	Hazardous Substance	Biodegradable Surfactant for Underground Chlorinated Solvent Remediation	Texas A & M University	TX - 31

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Ramachandran, Gurumurth	24	STAR Grant	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area	University of Minnesota	MINNESOTA
Ramachandran, Gurumurth	41	STAR Grant	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure	University of Minnesota	MINNESOTA
Ramanujam, Jagannathan	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	Louisiana State University - Baton Rouge	LA - 06
Randerath, Erika	188	Hazardous Substance	An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust	Lovelace Respiratory Research Institute	NM - 01
Randerath, Kurt	188	Hazardous Substance	An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust	Lovelace Respiratory Research Institute	NM - 01
Raney, Jay	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid	University of Texas at Austin	TX - 10
Recio, Leslie	192	Hazardous Substance	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites	University of New Orleans	LA - 02
Redman, T. K.	60	STAR Grant	Effects of Inhaled Ultrafine Particles on Asthma	Lovelace Respiratory Research Institute	NM - 01
Reeves, William	34	STAR Grant	Bioavailability & Risk Assessment of Complex Mixtures	Texas A & M University	TX - 31
Reible, Danny	232	Hazardous Substance	Hazardous Substance Research Center/South and Southwest	Louisiana State University	LA - 06
Reible, Danny	233	Hazardous Substance	Bioturbation and Bioavailability of Residual, Desorption-Resistant Contaminants	Louisiana State University	LA - 06
Reinhard, Martin	156	Early Competed Center	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics	Stanford University	CALIFORNIA
Reyes, Enrique	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	University of New Mexico	NM - 01

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Richardson, James T.	218	Hazardous Substance	Destruction of Chlorinated Hydrocarbons in Process Streams Using Catalytic Steam Reforming	University of Texas	TX - 10
Richardson, Tammi L.	93	STAR Grant	Gymnodinium breve in the Gulf of Mexico: Gyroxanthin-based Estimates of Carbon-Specific Growth Rates Under Varying Environmental Conditions	Texas A & M University	TX - 31
Riddle, Anita L.	196	Hazardous Substance	Field Study Abstract: A Model of Ambient Air Pollution in Southeast Texas Using Artificial Neural Network Technology	Lamar University	TX - 09
Rieken, Eric	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid	University of Texas - Pan American	TX - 15
Riggs, W.	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	University of California - Davis,South Dakota State University,University of Nebraska	
Rixey, William G.	223	Hazardous Substance	A Software Guidance System for Choosing Analytical Subsurface Fate and Transport Models Including a Library of Computer Solutions for the Analytical Models	Texas A & M University	TX - 31
Roberts, D. J.	219	Hazardous Substance	Integrated Process Treatment Train (Bioremediation {Aerobic/Anaerobic} and Immobilization) for Texas Soils Contaminated with Combined Hazardous Wastes	University of Texas	TX - 10
Roden, Eric E.	67	STAR Grant	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System	University of Alabama - Tuscaloosa	ALABAMA
Rodriguez, Robin R.	35	STAR Grant	Development of Chemical Methods to Assess the Bioavailability of Arsenic in Contaminated Media	Oklahoma State University	OK - 03
Rogers, William	89	STAR Grant	Chinese Tallow Invasions into the Endangered Coastal Prairie: Causes and Consequences	Rice University	TX - 18
Rose, K. A.	68	STAR Grant	Evaluation of Endocrine-Distrupting Chemical Effects Across Multiple Levels of Biological Organization: Integration of Physiology Behavior and Population Dynamics In Fishes	University of Texas at Austin	TX - 10
Rosenfield, Jonathan Alan	108	STAR Fellowship	Natural hybridization	University of New Mexico	NM - 01
Sabatini, David A.	47	STAR Grant	The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation	University of Oklahoma	OK - 04

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Sabatini, David A.	90	STAR Grant	The Influence of Amphiphilic Molecules on the Environmental Fate and Transport of Pharmaceuticals	University of Oklahoma	OK - 04
Safe, S. H.	34	STAR Grant	Bioavailability & Risk Assessment of Complex Mixtures	Texas A & M University	TX - 31
Samet, Jonathan M.	180	Hazardous Substance	Nitrogen Dioxide and Respiratory Illness in Children	Harvard School of Public Health	MASSACHUSET
Samet, Jonathan M.	181	Hazardous Substance	Noninvasive Methods for Measuring Ventilation in Mobile Subjects	University of New Orleans	LA - 02
Samuelson, Charles D.	66	STAR Grant	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning	Texas A & M University	TX - 31
Sanchez, Cassia M.	114	STAR Fellowship	Treatment of Arsenic Contaminated Drinking Water	New Mexico State University	NM - 02
Sanders, Dee Ann	171	Hazardous Substance	Evaluation of Road Base Material Derived from Tank Bottom Sludges	University of Oklahoma	OK - 04
Sankowski, Edward T.	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	University of Oklahoma	OK - 04
Santavy, Debbie	62	STAR Grant	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys	US EPA NHEERL: Gulf Breeze, FL	FLORIDA
Savelski, Mariano	87	STAR Grant	Wastewater Reuse and Zero Discharge Cycles in Process Plants	University of Oklahoma	OK - 04
Schkade, David A.	9	STAR Grant	How People Respond to Contingent Valuation Questions	University of Texas at Austin	TX - 10
Schmandt, Jurgen	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	University of Texas: Houston Advanced Research Center--Woodlands	TX - 08
Schmitter, Bob	237	Hazardous Substance	HSRC Technology Transfer, Training and Outreach	Texas A & M University	TX - 31

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Schulze-Makuch, Dirk	91	STAR Grant	Riverbank Filtration Effectiveness in an Arid Environment	University of Texas at Austin	TX - 10
Schwab, Margo	180	Hazardous Substance	Nitrogen Dioxide and Respiratory Illness in Children	Harvard School of Public Health	MASSACHUSET
Scuderi, Louis A.	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	University of New Mexico	NM - 01
Sexton, K.	41	STAR Grant	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure	University of Minnesota	MINNESOTA
Sexton, Ken	24	STAR Grant	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area	University of Minnesota	MINNESOTA
Seyed-Yagoobi, J.	208	Hazardous Substance	Combustion Enhancement by Radial Jet Reattachment - Low Generation of Hazardous Gases and High Thermal Efficiency	Texas A & M University	TX - 31
Shalaev, Vladimir M.	2	STAR Grant	Radiation Scattering by Fractal Clusters in Aerosols	New Mexico State University	NM - 02
Sharfman, Mark	12	STAR Grant	Regulation, Business, and Sustainable Development: The Management of Environmentally Conscious Technological Innovation Under Alternative Market Conditions	University of Oklahoma	OK - 04
Sharma, Mukul M.	1	STAR Grant	NMR Imaging of Biofilm Growth in Porous Media	University of Texas at Austin	TX - 10
Shields, David	231	Hazardous Substance	Life-Cycle Environmental Costing for Managing Pollution Prevention in the Chemical and Petroleum Refining Industries: A Cross-Border Approach	University of Texas at Houston	TX - 25
Siemann, Evan	89	STAR Grant	Chinese Tallow Invasions into the Endangered Coastal Prairie: Causes and Consequences	Rice University	TX - 18
Singh, Vijay P.	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	Louisiana State University - Baton Rouge	LA - 06
Sipes, James	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	University of Oklahoma	OK - 04

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Sisbarro, Daniel J.	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	University of Texas: Houston Advanced Research Center - Woodlands	TX - 08
Sischo, William M.	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	University of California - Davis	CALIFORNIA
Skipper, Betty J.	180	Hazardous Substance	Nitrogen Dioxide and Respiratory Illness in Children	Harvard School of Public Health	MASSACHUSET
Smallwood, B.	51	STAR Grant	Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment	University of Oklahoma	OK - 04
Smallwood, Barbara	51	STAR Grant	Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment	University of Oklahoma	OK - 04
Smith, B.	77	STAR Grant	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States	University of California - Davis,South Dakota State University,University of Nebraska	
Smith, L. M.	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Texas Tech University	TX - 19
Snell, Seth	78	STAR Grant	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin	University of New Mexico	NM - 01
Snethen, Donald R.	171	Hazardous Substance	Evaluation of Road Base Material Derived from Tank Bottom Sludges	University of Oklahoma	OK - 04
Snipes, M. Burton	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Speitel, Gerald E.	50	STAR Grant	Role of Microbial Metabolism and Cometabolism in Treating Mixtures of Biodegradable and Nonbiodegradable Chemicals in Granular Activated Carbon Columns	University of Texas at Austin	TX - 10
Speitel, Gerald E.	197	Hazardous Substance	Hollow Fiber Membrane Bioreactors for Treating Water and Air Streams Contaminated with Chlorinated Solvents	University of Texas	TX - 10
Spengler, John D.	180	Hazardous Substance	Nitrogen Dioxide and Respiratory Illness in Children	Harvard School of Public Health	MASSACHUSET

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Stanton, Alan C.	124	SBIR Phase I	A Near-Infrared Diode Laser-Based Continuous Emissions Monitor for Nitrogen Oxides	Southwest Sciences Inc.	NM - 03
Starr, James	53	STAR Grant	Biological Markers of Exposure to Benzene	Lovelace Respiratory Research Institute	NM - 01
Stefan, Heinz G.	17	STAR Grant	Alterations of Water Availability, Water Quality and Fish Habitats in Cold Regions by Climate Change	University of Minnesota	MINNESOTA
Stephens, Nicole D.	179	Hazardous Substance	Does Ozone Cause Precancerous Changes in Cells?	Lovelace Respiratory Research Institute	NM - 01
Sterling, Charles R.	13	STAR Grant	Virulence Factors in Cryptosporidium and Infective Dose in Humans	University of Texas Health Science Center-Houston	TX - 25
Stock, Tom	24	STAR Grant	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area	University of Texas at Austin	TX - 10
Stotts, Craig	25	STAR Grant	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer	University of Arkansas for Medical Sciences	AR - 02
Strevett, Keith A.	47	STAR Grant	The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation	University of Oklahoma	OK - 04
Sublette, Kerry	156	Early Competed Center	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics	University of Tulsa	OK - 01
Sublette, Kerry	170	Hazardous Substance	Integrated Petroleum Environmental Consortium (IPEC)	University of Tulsa	OK - 01
Suflita, Joseph	156	Early Competed Center	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics	University of Oklahoma	OK - 04
Suflita, Joseph	174	Hazardous Substance	Anaerobic Intrinsic Bioremediation of Whole Gasoline	University of Oklahoma	OK - 04
Suhayda, Joseph N.	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	Louisiana State University - Baton Rouge	LA - 06

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Sui, Daniel Z.	69	STAR Grant	Exploring the Environmental Impacts of the E-merging Digital Economy: Towards an Informational Ecology for the Greening of Electronic Commerce	Texas A & M University	TX - 31
Sullivan, Jeri	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid	University of Texas at Austin	TX - 10
Sun, James D.	179	Hazardous Substance	Does Ozone Cause Precancerous Changes in Cells?	Lovelace Respiratory Research Institute	NM - 01
Sutherlin, John	158	Hazardous Substance	Urban Waste Management & Research Center (University of New Orleans)	University of New Orleans	LA - 02
Sutherlin, John	164	Hazardous Substance	Urban Solid Waste Management Videos	University of New Orleans	LA - 02
Swafford, Deborah S.	189	Hazardous Substance	No Evidence For Genetic Mutations Found In Lung Tumors From Rats Exposed To Diesel Exhaust or Carbon Black	Lovelace Respiratory Research Institute	NM - 01
Sweeney, Anne	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	University of Texas at Houston	TX - 25
Swenberg, James A.	192	Hazardous Substance	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites	University of New Orleans	LA - 02
Sylvester, Paul	138	SBIR Phase I	The Reduction of Mercury and Sulfur Dioxide Emissions From Coal-Fired Power Plants	Lynntech Inc.	TX - 31
Symanski, Elaine	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	University of Texas at Houston	TX - 25
Symons, James M.	220	Hazardous Substance	Photo-Oxidation by H2O2/VisUV of Off-Gas Atmospheric Emissions from Industrial and Environmental Remediation Sources	Texas A & M University	TX - 31
Tanner, R.	47	STAR Grant	The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation	University of Oklahoma	OK - 04
Tanner, Ralph	156	Early Competed Center	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics	University of Oklahoma	OK - 04

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Taylor, Henry F.	86	STAR Grant	New Sensor Technology for Reducing Emissions from Automobiles	Texas A & M University	TX - 31
Taylor, Philip H.	82	STAR Grant	Oxidative Transformation of Model Oxygenated Hazardous Air Pollutants	University of Dayton	OHIO
Taylor, Scott R.	140	SBIR Phase I	Novel Cleanup of Metal Working Wastewaters	S.R. Taylor and Associates	OK - 01
Teh, Swee J.	26	STAR Grant	An in vivo Model for Detection of Reproductive Effects of Endocrine Disruptors	University of California - Davis	CALIFORNIA
Templet, Paul	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana	University of New Mexico	NM - 01
Tennakoon, Charles	125	SBIR Phase I	Dual Purpose Electrochemical Treatment of Wastewater	Lynntech Inc.	TX - 31
Tennakoon, Charles	127	SBIR Phase I	Self Contained Electrochemical System for Treating Paint Residue	Lynntech Inc.	TX - 31
Tennakoon, Charles	133	SBIR Phase I	Electrochemical Treatment of Textile Effluents with Simultaneous Recovery of Toxic Metals	Lynntech Inc.	TX - 31
Tercek, Michael T.	115	STAR Fellowship	Habitat Requirements and Evolution of Agrostis Rossiae Vasey, a Grass Endemic to Thermal Soils in Yellowstone National Park	Tulane University of Louisiana	LA - 02
Thayer, Mark	43	STAR Grant	Improving Air Quality Benefit Estimates from Hedonic Models	Louisiana State University - Baton Rouge	LA - 06
Theodorakis, C. W.	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Texas Tech University	TX - 19
Thiagarajan, Ganesh	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	University of Missouri - Kansas City	MISSOURI
Thibodeaux, Louis J.	157	Early Competed Center	Freshwater Bioturbators in Riverine Sediments as Enhancers of Contaminant Release	Louisiana State University - Baton Rouge	LA - 06

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Thibodeaux, Louis J.	236	Hazardous Substance	Contaminant Release During Removal and Resuspension	Louisiana State University - Baton Rouge	LA - 06
Thoma, Greg	177	Hazardous Substance	Using Plants to Remediate Petroleum-Contaminated Soil	University of Arkansas at Fayetteville	AR - 03
Thomas, Peter	46	STAR Grant	Reproductive and endocrine effects of o,p'-DDT, an environmental estrogen, and p,p'-DDE, an antiandrogen in male and female Atlantic croaker during critical periods of their reproductive life history cycles	University of Texas at Austin	TX - 10
Thomas, Peter	68	STAR Grant	Evaluation of Endocrine-Distrupting Chemical Effects Across Multiple Levels of Biological Organization: Integration of Physiology Behavior and Population Dynamics In Fishes	University of Texas at Austin	TX - 10
Thomassen, David G.	179	Hazardous Substance	Does Ozone Cause Precancerous Changes in Cells?	Lovelace Respiratory Research Institute	NM - 01
Thomassen, David G.	187	Hazardous Substance	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs	Lovelace Respiratory Research Institute	NM - 01
Thompson, Starley	19	STAR Grant	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.	National Center for Atmospheric Research	COLORADO
Tiernan, Timothy C.	153	SBIR Phase I	Rapid, Specific, Sensor System for Pathogens in Water	TPL Inc.	NM - 01
Timmons, Richard B.	4	STAR Grant	Novel Approach to Detoxification of Polychlorinated Solvents A Waste-to-Useful Fuel Conversion	University of Texas at Arlington	TX - 24
Tittlebaum, Marty	158	Hazardous Substance	Urban Waste Management & Research Center (University of New Orleans)	University of New Orleans	LA - 02
Tittlebaum, Marty	163	Hazardous Substance	Effectiveness of Rehabilitation Approaches for I/I Reduction	University of New Orleans	LA - 02
Tomson, M.	236	Hazardous Substance	Contaminant Release During Removal and Resuspension	Louisiana State University - Baton Rouge	LA - 06
Tremblay, Thomas	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid	University of Texas at Austin	TX - 10

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Tweedie, Richard L.	41	STAR Grant	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure	University of Minnesota	MINNESOTA
Twilley, Robert	75	STAR Grant	PULSES - The Importance of Pulsed Physical Events fdr Watershed Sustainability in Coastal Louisiana	University of New Mexico	NM - 01
Twilley, Robert	97	STAR Grant	Modeling the impacts of climate change on wetland ecosystems	University of Louisiana at Lafayette	LA - 07
Tzipori, Saul	76	STAR Grant	Infectivity and Virulence of Cryptosporidium Genotype H Oocysts in Healthy Adult Volunteers	University of Texas Health Science Center-Houston	TX - 25
Tzipori, Saul	92	STAR Grant	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers	Tufts University	MASSACHUSET
Valdes, Juan B.	203	Hazardous Substance	Stochastic Risk Assessment for Bioremediation	Texas A & M University	TX - 31
Valsaraj, K. T	234	Hazardous Substance	In-Situ Containment and Treatment: Engineering Cap Integrity and Reactivity	Texas A & M University	TX - 31
Valsaraj, K.T.	157	Early Competed Center	Freshwater Bioturbators in Riverine Sediments as Enhancers of Contaminant Release	Louisiana State University - Baton Rouge	LA - 06
Vardi, Moshe	21	STAR Grant	Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media	Rice University	TX - 18
Veenstra, John N.	171	Hazardous Substance	Evaluation of Road Base Material Derived from Tank Bottom Sludges	University of Oklahoma	OK - 04
Veenstra, John N.	173	Hazardous Substance	Demonstration of a Subsurface Drainage System for the Remediation of Brine-Impacted Soil	University of Tulsa	OK - 01
Vieux, Baxter	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	University of Oklahoma	OK - 04
Vipulanandan, C.	219	Hazardous Substance	Integrated Process Treatment Train (Bioremediation {Aerobic/Anaerobic} and Immobilization) for Texas Soils Contaminated with Combined Hazardous Wastes	University of Texas	TX - 10

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Vogel, Enrique	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	Instituto Tecnologico y de Estudios Superiores de Monterrey	MEXICO
Walker, Vernon	192	Hazardous Substance	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites	University of New Orleans	LA - 02
Waller, Lance	24	STAR Grant	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area	University of Minnesota	MINNESOTA
Waller, William T.	63	STAR Grant	Environmental Condition On-Line DFW Metroplex (ECOPLEX)	University of North Texas	TX - 26
Walther, Thomas	83	STAR Grant	Development of All-Solid-State Sensors for Measurement of Nitric Oxide and Carbon Monoxide Concentrations by Optical Absorption	Texas A & M University	TX - 31
Wang, D.	61	STAR Grant	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments	University of Oklahoma Health Sciences Center,University of Oklahoma	OK - 04,OK - 06
Wang, Joseph	81	STAR Grant	Biosensors for Field Monitoring of Organophosphate Pesticides	New Mexico State University	NM - 02
Ward, G. Milton	67	STAR Grant	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System	University of Alabama - Tuscaloosa	ALABAMA
Ward, George	16	STAR Grant	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin	University of Texas at Austin	TX - 10
Washburn, Barbara S.	26	STAR Grant	An in vivo Model for Detection of Reproductive Effects of Endocrine Disruptors	University of Texas at El Paso	TX - 16
White, William A.	70	STAR Grant	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid	University of Texas at Austin	TX - 10
Whitten, Guy D.	66	STAR Grant	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning	Texas A & M University	TX - 31
Widmer, Giovanni	76	STAR Grant	Infectivity and Virulence of Cryptosporidium Genotype H Oocysts in Healthy Adult Volunteers	University of Texas Health Science Center-Houston	TX - 25

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Widmer, Giovanni	92	STAR Grant	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers	Tufts University	MASSACHUSET
Wiesner, M.	234	Hazardous Substance	In-Situ Containment and Treatment: Engineering Cap Integrity and Reactivity	Texas A & M University	TX - 31
Wikstrom, C. V.	129	SBIR Phase I	High Efficiency Biofilter for Styrene Removal from Indoor Air	Bioengineering Resources Inc.	AR - 03
Wilding, Larry P.	207	Hazardous Substance	Permanence of Metals Containment in Solidified and Stabilized Wastes	Texas A & M University	TX - 31
Willett, Keith D.	38	STAR Grant	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River	Oklahoma State University	OK - 03
Williams, Anthony N.	223	Hazardous Substance	A Software Guidance System for Choosing Analytical Subsurface Fate and Transport Models Including a Library of Computer Solutions for the Analytical Models	Texas A & M University	TX - 31
Williams, Paige L.	188	Hazardous Substance	An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust	Lovelace Respiratory Research Institute	NM - 01
Williamson, Derek	103	STAR Fellowship	Intrinsic Bioremediation: Process Demonstration and Evaluation	University of Texas at Austin	TX - 10
Willis, D. B.	98	STAR Grant	Interactions among climate, humans and playa wetlands on the Southern High Plains	Texas Tech University	TX - 19
Willson, Richard C.	31	STAR Grant	Microbial Monitoring With Artificial Stable RNAs	University of Houston	TX - 18
Wilson, Vincent L.	39	STAR Grant	Improved Risk Assessment with an Intragenic Mutation Assay	Louisiana State University - Baton Rouge	LA - 06
Wolf, Duane	177	Hazardous Substance	Using Plants to Remediate Petroleum-Contaminated Soil	University of Arkansas at Fayetteville	AR - 03
Wright, Stuart A.	213	Hazardous Substance	A Comparative Study of Siting Opposition in Two Counties	Lamar University	TX - 09

Investigator	Ref. #	Grant	Abstract	Institution	Cong. Dist.
Wu, Xifeng	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	University of Texas at Houston	TX - 25
Wun, Chuan-Chuan	42	STAR Grant	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans	University of Texas at Houston	TX - 25
Yaws, Carl L.	227	Hazardous Substance	Pollution Prevention by Process Modification	Lamar University	TX - 09
Yaws, Carl L.	228	Hazardous Substance	Water Solubility and Henry's Law Constant	Lamar University	TX - 09
Yeh, Norman K.	109	STAR Fellowship	Liquid Phase Mass Transfer in Spray Contactors	University of Texas at Austin	TX - 10
Young, Stephen A.	180	Hazardous Substance	Nitrogen Dioxide and Respiratory Illness in Children	Harvard School of Public Health	MASSACHUSET
Zepp, Richard	62	STAR Grant	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys	US EPA NERL: Athens, GA	GEORGIA

Section 3.0

Grant References

Each scientific or technical grant included in this document is given a Grant Reference Number (GRN) from 1 to 237. The assignment of Grant Reference Numbers is arbitrary; they are solely used for increasing the ease by which a grant may be located by the user of this document. Section 3.1 contains the master list of GRNs, showing the corresponding EPA ID# and title for each.

Sections 3.2 through 3.5 of this document contain summary information for each grant. The GRN is located in a bold box in the top right corner of each entry. This number can be matched to the referenced provided in the indices of Sections 2.1 through 2.3. Additionally, Section 4 contains a Topic Index which enables the user to locate all grants involving a particular environmental topic. Each grant in Section 4 is referenced by its GRN.

Section 3.1

Grant Reference List

Grant Reference List

Ref. #	Grant #	Abstract
1	R821268	NMR Imaging of Biofilm Growth in Porous Media
2	R822658	Radiation Scattering by Fractal Clusters in Aerosols
3	R822668	Water as Solvent for Metal-Mediated Carbon-Carbon Bond Formations
4	R823179	Novel Approach to Detoxification of Polychlorinated Solvents A Waste-to-Useful Fuel Conversion
5	R823209	Physiological Effects of Pollutants in the Bottlenose Dolphin
6	R823335	VOC Emissions from Sewers Process Drains and Drop Structures
7	R823347	Optimization of Oil Biodegradation by Mixed Bacterial and Fungal Population An Innovative Microbial Delivery System and Oil-Absorbing Natural Material
8	R824029	Quantitation of Heavy Metals by Immunoassay
9	R824310	How People Respond to Contingent Valuation Questions
10	R824679	Preference Formation and Elicitation in Valuing Non-Market Goods
11	R824740	A Framework to Compare Polices for Source Reduction
12	R824748	Regulation, Business, and Sustainable Development: The Management of Environmentally Conscious Technological Innovation Under Alternative Market Conditions
13	R824759	Virulence Factors in Cryptosporidium and Infective Dose in Humans
14	R824770	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection
15	R824775	Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection
16	R824799	Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin

Ref. #	*Grant #*	*Abstract*
17	R824801	Alterations of Water Availability, Water Quality and Fish Habitats in Cold Regions by Climate Change
18	R824875	Reversible Inactivation of Viruses in Groundwater
19	R824997	Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.
20	R825155	Modeling Spatial and Temporal Dynamics of Montane Meadows and Biodiversity in the Greater Yellowstone Ecosystem
21	R825207	Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media
22	R825218	Mercury as an Insulin Mimic: Mechanism of Action and Potential Physiological Consequences
23	R825225	Geophysical Sensing in Environmental Applications: Efficient Numerical Simulations
24	R825241	Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area
25	R825280	Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer
26	R825298	An in vivo Model for Detection of Reproductive Effects of Endocrine Disruptors
27	R825328	Chemical Plant Wastewater Reuse and Zero Discharge Cycles
28	R825339	Novel Nanocoatings On Cutting Tools For Dry Machining
29	R825344	Field-Usable Compact Capillary Based Liquid/Ion Chromatographs - Real Time Gas/Aerosol Analyzers
30	R825350	Spatial and Temporal Patterns of Larval Fish Morphometrics as Indicators of Ecosystem Health
31	R825354	Microbial Monitoring With Artificial Stable RNAs
32	R825355	Developing a New Monitoring Tool for Benthic Organisms in the Gulf of Mexico: Loss of Genetic Variability in Meiofaunal Populations
33	R825405	A Multi-Scale Investigation of Mass Transfer Limitations in Surfactant-Enhanced Aquifer Remediation

Ref. #	*Grant #*	*Abstract*
34	R825408	Bioavailability & Risk Assessment of Complex Mixtures
35	R825410	Development of Chemical Methods to Assess the Bioavailability of Arsenic in Contaminated Media
36	R825414	Phytoremediation and Modeling of Land Contaminated by Hydrons
37	R825420	Intrinsic Stable Isotopic Tracers of Environmental Contaminants
38	R825791	Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River
39	R825810	Improved Risk Assessment with an Intragenic Mutation Assay
40	R825811	Age and Interactive Toxicity of Organophosphorus Insecticides
41	R825813	School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure
42	R825817	Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans
43	R825826	Improving Air Quality Benefit Estimates from Hedonic Models
44	R825868	Microbial indicators of biological integrity and nutrient stress for aquatic ecosystems
45	R825955	Development of Biomarkers for haloacetonitriles-induced cell injury in Peripheral Blood
46	R826125	Reproductive and endocrine effects of o,p'-DDT, an environmental estrogen, and p,p'-DDE, an antiandrogen in male and female Atlantic croaker during critical periods of their reproductive life history cycles
47	R826161	The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation
48	R826166	Investigation of the Elementary Reaction Mechanisms of Fly-Ash Mediated Formation of PCDD/F
49	R826168	Innovations in Vapor Phase Bioreactor Design
50	R826170	Role of Microbial Metabolism and Cometabolism in Treating Mixtures of Biodegradable and Nonbiodegradable Chemicals in Granular Activated Carbon Columns

Ref. #	*Grant #*	*Abstract*
51	R826178	Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment
52	R826242	Ecotoxicity Risks Associated with the Land Treatment of Petrochemical Wastes
53	R826249	Biological Markers of Exposure to Benzene
54	R826310	Exposure and Response of Morelet's Crocodile (Crocodylus moreletii) Populations to Endocrine Disrupting Compounds in Belize, Central America
55	R826409	Mechanism(s) of Chloroethylene-Induced Autoimmunity
56	R826649	Photochemical Processes Controlling Manganese Chemistry in Pristine and Contaminated Mountain Streams
57	R826769	A Portable Device for Real-Time Measurement of the Size and Composition of Atmospheric Aerosols
58	R826778	Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats
59	R826782	Airborne Particulate Matter-Induced Lung Inflammation
60	R826785	Effects of Inhaled Ultrafine Particles on Asthma
61	R826786	Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments
62	R826939	CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys
63	R827065	Environmental Condition On-Line DFW Metroplex (ECOPLEX)
64	R827116	Theoretical Evaluation of the Interfacial Area between Two Fluids in Soil
65	R827122	Development of a New Gas Sensing System Based on Terahertz Time-Domain Spectroscopy
66	R827147	Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning
67	R827168	Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System

Ref. #	Grant #	Abstract
68	R827399	Evaluation of Endocrine-Distrupting Chemical Effects Across Multiple Levels of Biological Organization: Integration of Physiology Behavior and Population Dynamics In Fishes
69	R827582	Exploring the Environmental Impacts of the E-merging Digital Economy: Towards an Informational Ecology for the Greening of Electronic Commerce
70	R827677	Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments
71	R827719	Ferric Oxide/Alkali Metal Oxide Induced Oxidation of CHCs in Polluted Gas Streams
72	R827930	Municipal Sewers as Sources of Hazardous Air Pollutants
73	R827963	The Tulsa Air and Water Quality Information System
74	R827964	Paso del Norte Environmental Monitor
75	R828009	PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana
76	R828035	Infectivity and Virulence of Cryptosporidium Genotype H Oocysts in Healthy Adult Volunteers
77	R828038	Prevalence and Distribution of Genotypes of Cryptosporidium Parvum in Feedlot in the Western United States
78	R828070	An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin
79	R828129	Forming Carbon-Carbon Bonds in Water and Other Alternative Media
80	R828135	Homogeneous Catalysis in Supercritical Carbon Dioxide with Fluoroacrylate Copolymer Supported Catalysts
81	R828160	Biosensors for Field Monitoring of Organophosphate Pesticides
82	R828175	Oxidative Transformation of Model Oxygenated Hazardous Air Pollutants
83	R828180	Development of All-Solid-State Sensors for Measurement of Nitric Oxide and Carbon Monoxide Concentrations by Optical Absorption
84	R828191	Toward the Development of a Detailed Mechanism of Transition Metal Catalyzed Formation of PCDD/F from Combustion Generated Hydrocarbons

Ref. #	*Grant #*	*Abstract*
85	R828208	Development of Life Cycle Inventory Modules for Semiconductor Processing
86	R828209	New Sensor Technology for Reducing Emissions from Automobiles
87	R828210	Wastewater Reuse and Zero Discharge Cycles in Process Plants
88	R828565	Fundamental Studies of Wood Interface Modification for Formaldehyde Pollution Avoidance and Prevention
89	R828903	Chinese Tallow Invasions into the Endangered Coastal Prairie: Causes and Consequences
90	R829005	The Influence of Amphiphilic Molecules on the Environmental Fate and Transport of Pharmaceuticals
91	R829009	Riverbank Filtration Effectiveness in an Arid Environment
92	R829180	Infectivity and Virulence of Cryptosporidium Non-parvum Species in Healthy Adult Volunteers
93	R829369	Gymnodinium breve in the Gulf of Mexico: Gyroxanthin-based Estimates of Carbon-Specific Growth Rates Under Varying Environmental Conditions
94	R829420E01	Human Activities and a Changing Climate in Louisiana
95	R829420E02	How likely is it that fish populations will successfully adapt to global warming?
96	R829420E03	Saltwater intrusion on the gulf coast: an assessment of the interactions of salinity stress, genetic diversity and population characteristics of fish inhabiting coastal marshes
97	R829420E04	Modeling the impacts of climate change on wetland ecosystems
98	R829641	Interactions among climate, humans and playa wetlands on the Southern High Plains
99	R829785	Evaluating Microbial Indicators and Health Risks Associated with Bank Filtration
100	R830413	Linking Population and Physiological Diversity in a Toxin-producing Dinoflagellate
101	GF9500575	Reductive Dehalogenation at Electrodes

Ref. #	Grant #	Abstract
102	GF9500913	Culture, Science and Uncertainty: Conflicting Positions on Climate Change
103	GF9502150	Intrinsic Bioremediation: Process Demonstration and Evaluation
104	GF9502211	Land Use and Natural Butterfly Populations: Assessing Anthropogenic Effects
105	U915323	Development and Demonstration of a Hollow Fiber Membrane Bioreactor for Cometabolic Degradation of Chlorinated Solvents
106	U915324	Environmental transport modeling
107	U915329	Image Use in the Characterization of Field Parameters
108	U915345	Natural hybridization
109	U915396	Liquid Phase Mass Transfer in Spray Contactors
110	U915465	Critical body residues and ion-exchange membranes as measures of heavy metal bioavailability and toxicity in soil
111	U915618	An Enhanced Aerosol Size Distribution Methodology
112	U915635	Atmospheric Organic Nitrogen - Origin, Speciation, and Significance in Global Marine Biogeochemistry
113	U915731	The Roles of Calcium-dependent Signal Transduction and Environmental Xenobiotic Chemicals in Modulating Ovarian Steroidogenesis in Sciaenids
114	U915800	Treatment of Arsenic Contaminated Drinking Water
115	U915807	Habitat Requirements and Evolution of Agrostis Rossiae Vasey, a Grass Endemic to Thermal Soils in Yellowstone National Park
116	68D99082	High-Performance, Low-Global-Warming Refrigerants for Domestic Refrigerators
117	68D00203	New Environmentally Benign Heteropolymolybdate Conversion Coatings for Aluminum Alloys
118	68D01056	A Novel Method for Converting a Negative Value Waste into a Commodity Chemical

Ref. #	*Grant #*	*Abstract*
119	68D01064	A New Microfluidic System for the Determination of Cryptosporidium Oocysts in Water
120	68D10058	Recycling of Polypropylene Carpet Waste into Polyester Carpet Backcoating
121	68D10062	Multi- Vortex System for Recovering Volatile Organic Contaminants from Industrial Gas
122	68D30124	Improved Method for Heating Catalytic Converters of Vehicles to Attain Ultra-Low Emissions
123	68D40065	Improved Method of Heating Catalytic Converters of Vehicles to Attain Ultra-Low Emissions
124	68D50068	A Near-Infrared Diode Laser-Based Continuous Emissions Monitor for Nitrogen Oxides
125	68D50100	Dual Purpose Electrochemical Treatment of Wastewater
126	68D50120	Electronics Industry Waste Stream Reduction
127	68D60025	Self Contained Electrochemical System for Treating Paint Residue
128	68D60031	Treatment of Produced Water from Coal-Bed Methane Production Using Carbon Aerogel Technology
129	68D60044	High Efficiency Biofilter for Styrene Removal from Indoor Air
130	68D70025	Low Cost Heavy Metals Removal from Hazardous Wastewaters
131	68D70040	Silica Materials for Mercury Recovery From Wastewater
132	68D70042	Novel Field Deployable Electrochemical Sensor for the Detection and Long-Term Monitoring of Pollutants
133	68D98114	Electrochemical Treatment of Textile Effluents with Simultaneous Recovery of Toxic Metals
134	68D98127	New Environmentally Benign Heteropolymolybdate Conversion Coatings for Aluminum Alloys
135	68D98133	Compact, Continuous Monitoring for Volatile Organic Compounds

Ref. #	Grant #	Abstract
136	68D98147	High-Performance, Low-Global-Warming Refrigerant for Domestic Refrigerators
137	68D99017	Recycling Process for Poultry Litter
138	68D99055	The Reduction of Mercury and Sulfur Dioxide Emissions From Coal-Fired Power Plants
139	68D99069	Portable Methane Flux Meter
140	68D00030	Novel Cleanup of Metal Working Wastewaters
141	68D00055	Reclamation of Soils and Soil Leachates Contaminated with Heavy Metals
142	68D00246	Novel Polymers With Immobilized Antimicrobial Enzymes for Disinfection
143	68D00247	A High Efficiency, Extremely Low Emission Internal Combustion Engine With On-Demand Generation of Hydrogen-Rich Gas by a Plasmatron
144	68D00248	A Novel Method for Converting a Negative Value Waste Into a Commodity Chemical
145	68D00249	A New Microfluidic System for the Determination of Cryptosporidium Oocysts in Water
146	68D00251	PheroJet Traps for Areawide Integrated Pest Management
147	68D00255	High Performance, Zero ODP Halon 1301 Replacement
148	68D01027	Novel Method for Ferrate Production
149	68D01044	Hand-Held Fluorometer Using SELEX DNA Aptamer Strip Assays To Detect Cryptosporidium and Encephalitozoon
150	68D02023	Development and Preliminary Validation of a Rapid Progestin-Based Endocrine Disruption Screening Assay
151	68D02030	A Universal Technique for Antimicrobial Surface Preparation Using Quaternary Ammonium-Functionalized Dendrimers
152	68D02033	SELEX DNA Aptamer Filter for Removal of Pesticides and Chloroaromatics

Ref. #	Grant #	Abstract
153	68D02038	Rapid, Specific, Sensor System for Pathogens in Water
154	68D02054	Novel Method for Ferrate Production
155	68D02099	Subsurface Treatment for Arsenic Removal
156	R825689C060	Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics
157	R825513C027	Freshwater Bioturbators in Riverine Sediments as Enhancers of Contaminant Release
158	R825427	Urban Waste Management & Research Center (University of New Orleans)
159	R825427C001	Comprehensive Evaluation of The Dual Trickling Filter Solids Contact Process
160	R825427C002	Issues Involving the Vertical Expansion of Landfills
161	R825427C003	Deep Foundations on Brownfields Sites
162	R825427C004	Ambient Particulate Concentration Model for Traffic Intersections
163	R825427C005	Effectiveness of Rehabilitation Approaches for I/I Reduction
164	R825427C006	Urban Solid Waste Management Videos
165	R825427C007	UWMRC Community Outreach Multimedia Exhibit
166	R825427C008	Including New Technology into the Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems - A User's Guide
167	R825427C009	Investigation of Hydraulic Characteristics and Alternative Model Development of Subsurface Flow Constructed Wetlands
168	R825427C010	Beneficial Use Of Urban Runoff For Wetland Enhancement
169	R825427C011	Urban Storm and Waste Water Outfall Modeling

Ref. #	*Grant #*	*Abstract*
170	R827015	Integrated Petroleum Environmental Consortium (IPEC)
171	R827015C001	Evaluation of Road Base Material Derived from Tank Bottom Sludges
172	R827015C002	Passive Sampling Devices (PSDs) for Bioavailability Screening of Soils Containing Petrochemicals
173	R827015C003	Demonstration of a Subsurface Drainage System for the Remediation of Brine-Impacted Soil
174	R827015C004	Anaerobic Intrinsic Bioremediation of Whole Gasoline
175	R827015C005	Microflora Involved in Phytoremediation of Polyaromatic Hydrocarbons
176	R827015C006	Microbial Treatment of Naturally Occurring Radioactive Material (NORM)
177	R827015C007	Using Plants to Remediate Petroleum-Contaminated Soil
178	R828112C046	How Do Chemicals in Diesel Engine Exhaust Damage DNA?
179	R828112C050	Does Ozone Cause Precancerous Changes in Cells?
180	R828112C058	Nitrogen Dioxide and Respiratory Illness in Children
181	R828112C059	Noninvasive Methods for Measuring Ventilation in Mobile Subjects
182	R828112C065	Effects of Prolonged Ozone Inhalation on Collagen Structure and Content in Rat Lungs
183	R828112C065III	Changes in Complex Carbohydrate Content and Structure in Rat Lungs Caused by Prolonged Ozone Inhalation
184	R828112C065V	Pulmonary Function Alterations in Rats After Chronic Ozone Inhalation
185	R828112C065VII	Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose
186	R828112C066	Interactive Effects of Nitropyrenes in Diesel Exhaust

Ref. #	*Grant #*	*Abstract*
187	R828112C068I	Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs
188	R828112C068II	An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust
189	R828112C068III	No Evidence For Genetic Mutations Found In Lung Tumors From Rats Exposed To Diesel Exhaust or Carbon Black
190	R828112C072	DNA Mutations in Rats Treated with a Carcinogen Present in Diesel Exhaust
191	R828112C090	A Pilot Study of Potential Biomarkers of Ozone Exposure
192	R828112C092	Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites
193	R828112C101	Penetration of Lung Lining and Clearance of Particles Containing Benzo[a]pyrene
194	R828112C102	Metabolism of Ether Oxygenates Added to Gasoline
195	R828598	Gulf Coast Hazardous Substance Research Center (Lamar University)
196	R828598C001	Field Study Abstract: A Model of Ambient Air Pollution in Southeast Texas Using Artificial Neural Network Technology
197	R828598C002	Hollow Fiber Membrane Bioreactors for Treating Water and Air Streams Contaminated with Chlorinated Solvents
198	R828598C003	Fugitive Emissions of Hazardous Air Pollutants from On-Site Industrial Sewers
199	R828598C004	Biofiltration Technology Development
200	R828598C005	A Risk-Based Decision Analysis Approach for Aquifers Contaminated with DNAPLs
201	R828598C006	In-Situ Remediation for Contaminated Soils Using Prefabricated Vertical Drains
202	R828598C007	Membrane Technology Selection System for the Metal Finishing Industry
203	R828598C012	Stochastic Risk Assessment for Bioremediation

Ref. #	Grant #	Abstract
204	R828598C013	Selective Removal of Heavy Metals from Wastewater by Chelation in Supercritical Fluids
205	R828598C014	Optimization of Treatment Technologies for Detoxification of PCB Contaminated Soils
206	R828598C015	Wastewater Remediation by Catalytic Wet Oxidation
207	R828598C016	Permanence of Metals Containment in Solidified and Stabilized Wastes
208	R828598C017	Combustion Enhancement by Radial Jet Reattachment - Low Generation of Hazardous Gases and High Thermal Efficiency
209	R828598C018	A Process To Convert Industrial Biosludge and Paper Fines to Mixed Alcohol Fuels
210	R828598C019	Homogeneous Catalysis in Supercritical Carbon Dioxide
211	R828598C021	The Binding Chemistry and Leaching Mechanisms of Advanced Solidification/Stabilization Systems for Hazardous Waste Management
212	R828598C022	Development of an Air-Stripping and UV/H2O2 Oxidation Integrated Process To Treat a Chloro-Hydrocarbon-Contaminated Ground Water
213	R828598C023	A Comparative Study of Siting Opposition in Two Counties
214	R828598C024	Sonochemical Treatment of Hazardous Organic Compounds II: Process Optimization and Pathway Studies
215	R828598C025	Laser Diagnostics of the Combustion Process within a Rotary Kiln Incinerator
216	R828598C026	Use of Inorganic Ion Exchangers for Hazardous Waste Remediation
217	R828598C027	Kaolinite Sorbent for the Removal of Heavy Metals from Incinerated Lubricating Oils
218	R828598C028	Destruction of Chlorinated Hydrocarbons in Process Streams Using Catalytic Steam Reforming
219	R828598C029	Integrated Process Treatment Train (Bioremediation {Aerobic/Anaerobic} and Immobilization) for Texas Soils Contaminated with Combined Hazardous Wastes
220	R828598C030	Photo-Oxidation by H2O2/VisUV of Off-Gas Atmospheric Emissions from Industrial and Environmental Remediation Sources

Ref. #	***Grant #***	***Abstract***
221	R828598C031	Concentrated Halide Extraction and Recovery of Lead from Soil
222	R828598C032	Biodegradable Surfactant for Underground Chlorinated Solvent Remediation
223	R828598C033	A Software Guidance System for Choosing Analytical Subsurface Fate and Transport Models Including a Library of Computer Solutions for the Analytical Models
224	R828598C035	Measurement of Oxygen Transfer Rate in Soil Matrices
225	R828598C036	Sorbent Technology for Multipollutant Control During Fluidized Bed Incineration
226	R828598C037	Pollution Prevention by Process Modification Using On-Line Optimization
227	R828598C038	Pollution Prevention by Process Modification
228	R828598C039	Water Solubility and Henry's Law Constant
229	R828598C040	Transferring Technical Information on Hazardous Substance Research by Publishing on the World Wide Web
230	R828598C041	Stress Protein Responses to Multiple Metal Exposure in Grass Shrimp
231	R828598C042	Life-Cycle Environmental Costing for Managing Pollution Prevention in the Chemical and Petroleum Refining Industries: A Cross-Border Approach
232	R828773	Hazardous Substance Research Center/South and Southwest
233	R828773C001	Bioturbation and Bioavailability of Residual, Desorption-Resistant Contaminants
234	R828773C002	In-Situ Containment and Treatment: Engineering Cap Integrity and Reactivity
235	R828773C003	Phytoremediation in wetlands and CDFs
236	R828773C004	Contaminant Release During Removal and Resuspension
237	R828773C005	HSRC Technology Transfer, Training and Outreach

Section 3.2

Listings 1 to 100

STAR Grant White Pages

1

Type: STAR GRANT
Status: Completed
Reports: Final

NMR Imaging of Biofilm Growth in Porous Media

EPA Grant Number: R821268
Title: NMR Imaging of Biofilm Growth in Porous Media
Investigators: Mukul M. Sharma
Institution: University of Texas at Austin
EPA Project Officer: Barbara Levinson
Project Period: September 1, 1995 through August 1, 1999
Project Amount: $449,760
Research Category: Chemistry and Physics of Water

Description:

The transport and growth of microorganisms in the subsurface is of relevance to microbial ecology in aquifers and sediments and to the in-situ biodegradation of organic contaminants. In-situ bioremediation (or bioaugmentation) processes have been applied to contaminant sites that contain aliphatic hydrocarbons, aromatics, polycyclic compounds, polychlorinated biphenyls and other organic contaminants. To effectively biodegrade these hazardous chemicals, specific strains of microorganisms need to be provided in-situ at sufficiently high concentrations. Ideal conditions for growth and degradation in the subsurface is a challenging task since the metabolic activity of the cells as measured in fermenters differs significantly from that in a subsurface environment.

Approach:

A number of studies have been conducted on sand columns to investigate the migration and/or growth of cells in porous media (Fontes, et al., 1991; Sharma, et al., 1985; Taylor et al.., 1990; and Vandevivere et al., 1992). Simulating the growth and migration of the cells in a laboratory environmental is an important step in understanding their behavior in the subsurface. Results from such a study are an essential starting point for any geochemical modeling of the subsurface ecology. In an ideal experiment, the pressure drop, flow rate and the cells and nutrient concentrations in the effluent and influent are monitored as a function of time. This data provides incomplete information about the transport and growth of the biomass in-situ. Withdrawing a fluid sample from sampling ports or monitoring the effluent cell concentration is an erroneous procedure because it ignores the biofilm that may be present on the surfaces of the pores. Indeed in many instances, biofilm growth is the dominant mechanism by which cell populations colonize subsurface environments. There is currently no direct method for monitoring the in-situ cell concentrations in such experiments. There is, therefore, an urgent need to develop a methodology that will allow us to continuously monitor in-situ cell concentrations in laboratory experiments conducted to simulate the subsurface environment.

Expected Results:

Our objective in this proposal is to develop such a methodology. A nuclear magnetic resonance imaging technique is proposed to be developed that will allow us to map in three dimensions the in-situ distribution of biofilms in porous media. In addition data can be obtained on the evolution of the fluid velocity distribution with time as biofilm growth occurs. A brief review of NMR techniques that will be used to locate and identify the cells is provided below. Some preliminary results are provided to demonstrate the feasibility of the idea. Finally, the proposed research tasks are discussed in detail.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/499/report/F

2

Type: STAR GRANT
Status: Project Period Concluded
Reports: No Reports Available Yet

Radiation Scattering by Fractal Clusters in Aerosols

EPA Grant Number: R822658
Title: Radiation Scattering by Fractal Clusters in Aerosols
Investigators: Vladimir M. Shalaev, George Goedecke
Institution: New Mexico State University
EPA Project Officer: Virginia Broadway,
Project Period: October 15, 1995 through October 14, 1997
Project Amount: $95,461
Research Category: Minority Institutions

Description:

In this project, a theory of radiation extinction and scattering by complex aerosols having fractal structure is proposed to develop. The proposed research is aimed at building a model of light scattering for pollution identification and characterization. The effect of radiation scattering by fractal pollutants on the environment will be also studied in the present project. Specifically, the following studies are proposed: the resonant and nonresonant scattering and absorption by fractal clusters in the atmosphere such as smoke, metal aerocolloidal aggregates and some biological macromolecules and chemical compounds having fractal structure. All these objects are aggregates of small particles which have combined into sparse random fractal clusters.
The main objective of this project is to develop the fluctuation theory of the scattering by fractal objects in the atmosphere. Such a new theory will take into account the fractal morphology and the strong fluctuations associated with the fractality. A renormalization analysis of the field fluctuations within a cluster will be used to build the theory. The results obtained will be applied to identification of pollutants having fractal structure.

Approach:

To develop the optics of fractals such as smoke is important for solution of environmental problems caused by the extinction and scattering from soot clusters lofted into the atmosphere by diesel engines, industrial stacks and large fires and, in particular, from those produced by multiple nuclear explosions. Closely connected with these problems is the greenhouse effect.
To study radiation scattering by such complex man-made aerosols as aerocolloidal metal aggregates, fractal chemical compounds and biological macromolecules is of interest for remote

detection of airborne chemical and biological agents in the atmosphere. If particles forming a cluster possess a resonance with a high quality-factor, then localized zones of high fields are induced in the fractal cluster under the resonant excitation. These "hot" zones are associated with excitation of collective dipolar eigenmodes which appear to be strongly localized within areas smaller than the wavelength. The domains of high fields result ultimately in greatly enhanced scattering. A point of emphasis in the proposed study of the resonant scattering from complex aerosols will be the fluctuations which play especially important role when exciting the resonant eigenmodes of fractal pollutants.

Expected Results:

The proposed research is expected to contribute to development of a model for remote identification and characterization of pollution. Specifically, a comprehensive theory of radiation scattering and absorption by complex aerosols having irregular chain-like morphology such as soot clusters and some biological and chemical pollutants will be developed.

Type: STAR GRANT
Status: Completed
Reports: Final

Water as Solvent for Metal-Mediated Carbon-Carbon Bond Formations

EPA Grant Number: R822668
Title: Water as Solvent for Metal-Mediated Carbon-Carbon Bond Formations
Investigators: Chao-Jun Li
Institution: Tulane University of Louisiana
EPA Project Officer: Barbara Karn
Project Period: August 1, 1997 through July 31, 2000
Project Amount: $200,000
Research Category: Technology for a Sustainable Environment

Description:
This award is made to Dr. Chao-Jun Li of the Chemistry Department, Tulane University, for investigation of carbon-carbon bond formation in water. The award is in the Technology for Sustainable Environment component of the EPA/NCER Parnership for Environmental Research, and support is provided by the Organic Synthesis Program and the Office of Multidisciplinary Activities. Carbon-carbon bond forming reactions are typically carried out using metal catalysts in anhydrous organic solvents. In this study, the synthesis of various biologically important compounds and fine chemicals will be carried out in aqueous medium. The new method will be more efficient since the number of synthetic steps will be reduced. Additional research to attempt to make the reaction catalytic is also planned. Metal recovery and recycling from the aqueous stream will be used to ensure that the new process is environmentally beneficial. The specific reactions to be investigated include indium-promoted allylations, propargylation-allenylations, and aldol reactions. Large volumes of organic solvents are used in fine chemical and pharmaceutical industries for both reactions and product isolation. These solvents must be recycled or treated by costly methods rather than being expelled into the environment. By developing alternative synthetic methods using water as a solvent, the disposal problem for organic solvents can be reduced.

Summary/Accomplishments:
Research during this project period on metal-mediated carbon-carbon bond formation in aqueous media has led to extend the scope, synthetic potential, and a better understanding of the reaction. Representative progresses include the following: the study has resulted in the development of a new ring-expansion method that is useful for the synthesis of medium- and large-ring natural products. The expansions also include the synthesis of heterocyclic compounds. The research also developed a regio- and diastereoselective propargylation-allenylation reaction in the media. The reaction has been applied to the synthesis of several biologically important natural products,

with the synthesis of one anti-tumor natural product (+)-goniofufurone being completed last year. Several natural products are in satisfactory progress. We also have investigated the potential use of other metals for the aqueous reaction. This led to the observation of completely chemoselective allylation and pinacol coupling for aromatic aldehydes by using manganese as the mediator catalyzed by copper. The research also led to the surprising observation that the classical Barbier-Grignard reaction with magnesium can proceed in water alone or dry THF, but not in THF-water. This shed new light on the mechanism and possibility of extending the scope of this type of reaction. We also have had preliminary success in using electricity as the electron source for effecting carbon-carbon bond formation in water, in which no metal (stoichiometric or catalytic) was used (except the inert electrode).

We have explored a variety of other novel organic transformations and syntheses through the use of water as solvent in our laboratory. Structural transformations through the internal isomerization of functionalities represent the most economical way of organic transformations. We have described a novel reaction in which homoallyl alcohols and allyl alcohols undergo structural reorganization in which both the hydroxyl group and the olefin have been reshuffled in the presence of a catalytic amount of $RuCl2(PPh3)3$ in water. A novel palladium catalyzed aryl halide-acetylene gas coupling reaction was developed in water. The catalytic reaction has been applied to the synthesis of novel photo/electronic materials. In addition, we also have succeeded in aqueous arylation through a novel rhodium catalyzed reaction in air and water.

In the past 3 years of the support, over 50 journal articles, 1 book, and several book chapters have been published on work related to the support. In the past 2 years of EPA/NCER support, 12 graduate students, 5 undergraduate students, and 5 postdoctoral fellows have worked on projects either directly or indirectly related to this project and have benefited from this support. Eight graduate students have received their Ph.D. and MS degrees during this period on related research. Currently, most of them are employed in pharmaceutical companies or in chemical industries in the country.

The study is closely related to the mission of pollution prevention in several aspects: using water as solvent that is nonpolluting for chemical synthesis; saving synthetic steps by avoiding many protection and deprotection processes that contribute to overall synthetic efficiency and a reduction in solvent emission (i.e., in product separation); developing methods with metal being catalytic, recovered, and recycled in-process so that no burden is put on the treatment of aqueous waste; the aqueous reaction is generally more selective in product formation than its counterpart in organic solvent; the aqueous reaction is energy-efficient for using ambient temperature compared to similar reactions in organic solvent using a severely low temperature (e.g., lithium reagent); and the reaction is readily applicable to large-scale manufacturing that, as a result, will help to reduce negative impacts on health and the environment. The present project provides the foundation for catalytic process in water by in-house recycling production systems that will minimize the environmental impact of chemical manufacturing as well as save the resources.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/970/report/F

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Type: STAR GRANT
Status: Completed
Reports: 1999, Final

Novel Approach to Detoxification of Polychlorinated Solvents A Waste-to-Useful Fuel Conversion

EPA Grant Number: R823179
Title: Novel Approach to Detoxification of Polychlorinated Solvents A Waste-to-Useful Fuel Conversion
Investigators: Richard B. Timmons
Institution: University of Texas at Arlington
EPA Project Officer: S. Bala Krishnan
Project Period: October 1, 1995 through September 1, 1998
Project Amount: $303,082
Research Category: Engineering

Description:

The purpose of this project is to evaluate the utility of a heterogeneous catalytic hydrodechlorination process as a viable disposal route for hazardous chlorinated waste liquids. In contrast with the numerous catalytic oxidation and combustion studies of chlorinated waste destruction, there have been few investigations of reductive processes as an alternate route to detoxification of these materials. Most importantly, the proposed hydrodechlorination process would lead to useful hydrocarbons and HCl as reaction products. This can be contrasted with typical oxidative processes which are known to produce a wide range of undesirable by-products including, in some cases, potential carcinogenic compounds (such as furans and dioxins). The chemical thermodynamics for these proposed hydrodechlorination processes are extremely favorable, including conversion of heavily polychlorinated molecules, as driven mainly by the large, negative free energy of formation of HCl.

Approach:

The current project is predicated on preliminary data, from our laboratory, in which complete catalytic hydrodechlorination has been demonstrated with several of the most commonly used industrial chlorinated solvents. However, despite favorable thermodynamic considerations, undesirable chemical kinetic factors led to slow coking of the catalyst and, ultimately, to catalyst deactivation. Thus, a primary focus of the present project is to improve significantly catalyst activity and longevity for these hydrodechlorination processes. To achieve this goal, systematic evaluation of a wide range of potential catalyst materials will be conducted. In particular, the work centers on preparation and evaluation of selected bifunctional catalysts in which active hydrogenolysis metals (e.g., Ni, Pt, etc.) are supported on materials which are known to provide good resistance to coking (e.g., small pore shape selective zeolites). These catalyst evaluation studies are accompanied by detailed catalyst characterization, including in situ spectroscopic analysis of the hydrodechlorination reaction processes.

Expected Results:

In this way, the current detailed microscopic level exploratory research work will hopefully lead to the identification of a specific catalyst formulation which is sufficiently promising for future, much larger scale, conversion experiments.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/664/report/1999

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/664/report/F

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Type: STAR GRANT
Status: Project Period Concluded
Reports: No Reports Available Yet

Physiological Effects of Pollutants in the Bottlenose Dolphin

EPA Grant Number: R823209
Title: Physiological Effects of Pollutants in the Bottlenose Dolphin
Investigators: David L. Busbee
Institution: Texas A & M University
EPA Project Officer: Dale Manty
Project Period: January 1, 1996 through December 31, 1998
Project Amount: $416,564
Research Category: Environmental Biology

Description:

The estuarine and near shore waters of industrialized and agricultural areas are contaminated with a mixture of pollutants, including halogenated aromatic hydrocarbons (HAH), aromatic hydrocarbons (AH), and polycyclic aromatic hydrocarbons (PAH). Among these are a number of toxic and/or carcinogenic chemicals that are known to stimulate a variety of adverse responses in man and laboratory animals, including weight loss, dermal lesions, thymic atrophy, immune system dysfunction, and cell transformation.

Approach:

This proposal plans to evaluate some of the physiological and biochemical responses to HAH, AH and PAH in tissues of bottlenose dolphins from heavily polluted areas of the Texas Gulf Coast. Control animals for this study will be resident dolphins maintained at the US Naval Command, Control and Ocean Surveillance Center (NCCOSC, RTD&E Div, NRAD), in San Diego. Test animals will include dolphins that strand on the Texas coast and are studied in an ongoing Marine Mammal Research Program at Texas A&M University. Control animals will provide blood samples and skin biopsies. From these we will obtain blood serum, peripheral blood lymphocytes, skin keratinocytes and subdermal blubber. In addition, stranded animals that die will provide a source of liver that will be taken when it can be obtained immediately after death, and large quantities of skin and blubber for extensive examinations and for methods development. Chemical residue levels and specific residue compositions will be determined on blubber samples. Mitogen-initiated blastogenesis in peripheral blood lymphocytes and immunoglobulin levels in serum of control animals will be determined as measures of normal immune system function. Hydrocarbon-DNA adduct levels will be assessed in epidermal keratinocytes, hepatocytes (when possible), and peripheral blood lymphocytes. Capacity to repair DNA damage will be evaluated in keratinocytes and peripheral blood lymphocytes. Cytochrome P450 induction capacity and the capacity to metabolize reference chemicals will be determined in fresh and cultured epithelial cells.

Expected Results:

The approach is to initiate development of a dolphin CYP1A1 cDNA which will be used for probe development and will be cloned into a baculovirus expression system to obtain pure protein for hybridoma and monoclonal anti-dolphin CYP1A1 IgG generation. Simultaneously, cytochrome P450s isolated from liver samples will be purified to isozyme levels and used to generate monoclonal or polyclonal IgG specific to dolphin CYP1A1. This investigation will provide data for the determination of how dolphins react to hydrocarbon pollutants. This could provide a basis for the development of regulatory guidelines and policies governing the tolerance levels for chronic chemical exposure in marine mammals.

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Type: STAR GRANT
Status: Completed
Reports: 1998, Final

VOC Emissions from Sewers Process Drains and Drop Structures

EPA Grant Number: R823335
Title: VOC Emissions from Sewers Process Drains and Drop Structures
Investigators: Richard L. Corsi
Institution: University of Texas at Austin
EPA Project Officer: Paul Shapiro
Project Period: October 1, 1995 through September 1, 1998
Project Amount: $271,896
Research Category: Environmental Engineering

Description:

As a result of the Clean Air Act of 1990, several industries are required to estimate emissions of hazardous air pollutants (HAPs) from on-site industrial sewers, and to control such emissions where appropriate. However, existing methods for estimating HAP emissions from sewer components are either non-existent or characterized by a high degree of uncertainty. The purpose of this project is to conduct a series of experiments to better understand the mechanistic behavior of HAP emissions from industrial process drains and sewer drop structures. Experimental data will be used to determine fundamental mass transfer parameters, with subsequent use of those parameters in a state-of-the-art computational model that will also be developed as part of this study.

Approach:

Experimental studies will be completed in two separate phases. Phase I will involve the construction and application of an industrial drain simulator housed in an environmental chamber. A cocktail of five volatile HAP surrogates will be used to determine HAP stripping efficiencies and mass transfer coefficients over a wide range of chemical properties, fluid properties, and environmental conditions, e.g., temperature and wind. Experiments will be further divided into process drains with and without water seals.

Phase II experiments will involve the construction and use of an industrial drop simulator. The same cocktail of volatile tracers will be used to study HAP stripping efficiencies and mass transfer coefficients. A wide range of drop operating conditions will be studied, with particular attention given to correlating HAP mass transfer coefficients to power input, and HAP stripping efficiencies to oxygen transfer. Specific mechanisms of mass transfer, e.g., stripping by entrained air versus volatilization from a falling water film, will also be investigated.

The model that results from this study will allow both industry and the regulatory communities to develop improved HAP emissions estimates for specific industrial facilities or sectors. The mechanistic nature of the model will also be valuable for investigating passive control strategies that suppress HAP emissions.

Expected Results:

The results of the study would: 1) assist EPA in the development of industry-specific NESHAPs, 2) provide the ability to routinely and accurately estimate VOC emissions from municipal and industrial wastewater, and 3) control VOC emissions by use of (hopefully) minor process changes to suppress gas-liquid mass transfer.

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/667/report/1998

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/667/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: No Reports Available Yet

Optimization of Oil Biodegradation by Mixed Bacterial and Fungal Population An Innovative Microbial Delivery System and Oil-Absorbing Natural Material

EPA Grant Number: R823347
Title: Optimization of Oil Biodegradation by Mixed Bacterial and Fungal Population An Innovative Microbial Delivery System and Oil-Absorbing Natural Material
Investigators: Raul G. Cuero
Institution: Prairie View A & M University
EPA Project Officer: Virginia Broadway
Project Period: September 1, 1995 through August 1, 1997
Project Amount: $131,617
Research Category: Minority Institutions

Description:

The objective of this project is to develop and optimize a method for biodegradation of oil-contaminated soils under laboratory and pilot scale composting conditions, and in liquids by using mixed microbial population from different taxa, a microbial delivery system, and a natural oil-absorbent.

Approach:

The experimental approach is to use several microbial strains from different taxa with oil-biodegrading characteristics along with an innovative microbial delivery system (chitosan) to assure continued microbial cometabolic action in a composting system. A natural, safe, oil absorbent (kenaf core, and/or oat micro-particles) will also be used to enhance oil-biodegradation in both compost and liquid conditions. Diatomaceous earth (DE) or bentonite will be applied to improve porosity and stability during composting. The method will be developed: 1) in a set of PVC columns for initial testing on oil-contaminated soil; and 2) in a chemostat for testing of the method on oil-contaminated liquids and for testing microbial survival. Rate of soil degradation, total oil degradation, total oil degradation, oil biodegradation intermediates. CO_2 production, determination of presence of alkene and alkine, total microbial viable count (TVC), and most probable number (MPN). Gravimetric total petroleum hydrocarbon analysis (APHA et al., 1992) will be carried out. Glass chemostats will be used to monitor the microbial growth when subjected to crude oil, and to determine presence of biodegradation-mediated enzymes (e.g., oxygenase, dehalogenase, etc., [Dagley, 1971]).

Expected Results:

The results of these experiments will provide the information required to systematically identify reliable parameters for developing a kit to assess a given oil-contaminated area in a particular time, and also for modeling of the process.

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Type: STAR GRANT
Status: Completed
Reports: 1998, Final

Quantitation of Heavy Metals by Immunoassay

EPA Grant Number: R824029
Title: Quantitation of Heavy Metals by Immunoassay
Investigators: Diane A. Blake
Institution: Tulane University of Louisiana
EPA Project Officer: Barbara Levinson
Project Period: September 1, 1995 through August 31, 1998
Project Amount: $381,920
Research Category: Chemistry and Physics of Water

Description:

The purpose of this project is to develop immunoassay techniques for the measurement of heavy metal contamination in environmental samples. Immunoassays offer significant advantages over more traditional methods of metal ion analysis; they are quick, inexpensive, simple to perform, and sufficiently portable to be used at the site of contamination. At present, however, immunochemical-based detection of metals is limited by the very small number of antibodies that recognize specific metal ions. Studies during the project period will be directed towards isolation and characterization of monoclonal antibodies that recognize chelated forms of cadmium, copper, lead, and zinc. These antibodies will subsequently be used to construct and optimize immunoassays for specific heavy metals in ambient water and soil samples.

Approach:

Bifunctional derivatives of metal ion chelators (EDTA, DTPA, DOTA) will be covalently conjugated to proteins and loaded with the desired metal ion. These conjugates will be used to prepare hybridoma cell lines which synthesize metal-specific monoclonal antibodies. The ability of these monoclonal antibodies to recognize specific metals in metal-chelate complexes will be assessed, and those antibodies with appropriate binding properties will be used to construct metal ion immunoassays. In previous EPA-supported studies, our laboratory developed a prototype immunoassay that reliably measured the heavy metal indium at concentrations from 0.005 ppb to 320 ppm (Anal. Biochem. (1994) 217:70-75); similar performance characteristics are expected from new metal ion immunoassays.

Expected Results:

Sample analysis is one of the major expenses in the remediation of a contaminated site, and studies have shown that the use of immunoassays can reduce analysis costs by 50% or more, when compared to off-site analysis by more standard techniques. The availability of immunoassays for specific metal ions will lower analysis costs and provide a useful adjunct to more traditional methods of metal analysis.

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/506/report/1998

Final Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/506/report/F

Type: STAR GRANT
Status: Completed
Reports: 1997, Final

How People Respond to Contingent Valuation Questions

EPA Grant Number: R824310
Title: How People Respond to Contingent Valuation Questions
Investigators: John W. Payne, William H. Desvouges, David A. Schkade
Institution: Duke University , Research Triangle Institute , University of Texas at Austin
EPA Project Officer: Matthew Clark
Project Period: October 1, 1995 through April 30, 1998
Project Amount: $238,510
Research Category: Valuation and Environmental Policy

Description:

The purpose of the project is to understand better how individuals interpret and respond to contingent valuation (CV) questions. The research will address three issues: the reliability of the referendum questions format, the importance of reminding respondents about substitutes, and the sensitivity of CV estimates of the scope of potential natural resource injuries.

Approach:

An interdisciplinary team of economists and psychologists will direct the research. A verbal protocol methodology adapted from the field of cognitive psychology will be used to provide insights into thought processes that lead to observed CV response. These protocols involve the process of respondents "thinking aloud" while they answer the CV questions. This process yields insights on both the decision process that people use to answer questions and the information they use as part of the decision process. Protocols will follow a research design that will enable the results to be useful for both hypothesis testing and developing more general insights about people's response patterns.

Expected Results:

Surveys will be used to further test the findings of the verbal protocol research.

Progress and Final Reports:

1997 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/80/report/1997

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/80/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1997

Preference Formation and Elicitation in Valuing Non-Market Goods

EPA Grant Number: R824679
Title: Preference Formation and Elicitation in Valuing Non-Market Goods
Investigators: David S. Brookshire, Robert Berrens, Philip Ganderton, Michael McKee, Hank Jenkins, Hillard Kaplan,
Institution: University of New Mexico - Main Campus
EPA Project Officer: Matthew Clark
Project Period: October 1, 1995 through September 30, 1997
Project Amount: $184,998
Research Category: Valuation and Environmental Policy

Description:

The general research objective of this interdisciplinary project is to investigate the interaction between value formation and value elicitation. The basic premise is that an understanding of how individuals form environmental values (e.g., purchase versus contribution model) cannot be decoupled from the value statement problem and the choice of elicitation mechanism. The corollary premise is that social context is an important, but relatively unexplored, determinant of both value formation and value statement.

Social context effects may be at work at both a larger level (in the attitudes and beliefs of respondents concerning particular environmental policies) and within the highly structured stated preference communication process. Once recognized, a variety of testable hypotheses can be generated. It is hypothesized that the multi-dimensional nature of many environmental policies may generate both positive and negative passive use values, that there may be significant social desirability response effects for some environmental policy changes, and that the relative magnitude of these effects may be influenced by individual characteristics, attitudes, and the methods employed for eliciting values. Likewise, it is hypothesized that nonresponse and protest response behavior may be influenced by individual characteristics, attitudes, and the elicitation mechanism.

Approach:

The methods to be employed in this research will include a unique combination and sequencing of field surveys and laboratory experiments. The field research will be a series of telephone surveys, with some sample treatments augmented by informational mailings, to address valuation questions and to collect detailed demographic and attitudinal information. The field research will be integrated with a series of laboratory experiments on public goods provision. Both field research and lab experiments yield unique insights (the richness and variability of field data versus the highly controlled nature of the lab). The structure of this research is designed to combine these insights. For example, a comparison of actual versus hypothetical payment for an environmental public good will be made in the lab and validated against the econometric estimates of stated preferences in the field. The application of these methods will be targeted to environmental issues of southwestern ecosystems. While not tied to a particular policy case, the focus on protection of riparian areas and instream flows, and ecological restoration of rangelands will provide general policy relevance. Pilot studies have been initiated on these topics, and will be complemented by a set of focus groups to identify all important dimensions of the environmental goods.

Expected Results:

The results of this research will aid in the assessment of current stated preference methods and guidelines, and expand the knowledge of the interaction between value formation and value elicitation. Improved understanding of social context will provide a clear advancement in the use and design of stated preference approaches. Important incremental gains will also be provided by empirical validation of the multidimensional nature of environmental values, identification of the presence and relative magnitude of social desirability effects, and the characterization and treatment of nonresponse and protest behavior.

Progress and Final Reports:

1997 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/146/report/1997

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Type: STAR GRANT
Status: Completed
Reports: Final

A Framework to Compare Polices for Source Reduction

EPA Grant Number: R824740
Title: A Framework to Compare Polices for Source Reduction
Investigators: Don Fullerton
Institution: University of Texas at Austin
EPA Project Officer: Paul Shapiro
Project Period: October 1, 1995 through September 30, 1997
Project Amount: $88,784
Research Category: Incentives and Impediments to Pollution Prevention

Description and Approach:

The purpose of this project is to build a single analytical general equilibrium model of the U.S. economy for use in comparing alternative polices for source reduction or "green design." The model encompasses the entire life-cycle of a product including design, production, packaging, sale, consumption, and disposal. It also encompasses market clearing at each of these phases, and the possibility of negative externalities from disposal. Thus, if consumers had to pay for the full social cost of disposal of each item, then they would demand goods with less packaging and with recyclable designs. Since consumers generally do not pay a price per bag of curbside garbage disposal, however, any particular item can be discarded for free. Producers then are not induced to sell goods with less packaging or more recyclable designs. The same model can then be used to solve for policies directed at firms that would equivalently reduce packaging and increase recyclability.

Expected Results:

This model will be extended to a second-best framework, with pre-existing labor taxes and other distortions, to see how these policies for green design can simultaneously address environmental problems and revenue needs.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/621/report/F

Type: STAR GRANT
Status: Completed
Reports: 1997, Final

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Regulation, Business, and Sustainable Development: The Management of Environmentally Conscious Technological Innovation Under Alternative Market Conditions

EPA Grant Number: R824748
Title: Regulation, Business, and Sustainable Development: The Management of Environmentally Conscious Technological Innovation Under Alternative Market Conditions
Investigators: Mark Sharfman, Mark Meo, Rex Ellington
Institution: University of Oklahoma
EPA Project Officer: Paul Shapiro
Project Period: October 1, 1995 through September 30, 1997
Project Amount: $244,955
Research Category: Incentives and Impediments to Pollution Prevention

Description:

The goals of this research are to advance our theoretical understanding of the development and adoption/diffusion of environmentally conscious, or "green," technological innovation in order to improve technology management in the firm, as well as increase the likelihood that firms will be able to successfully adopt these innovations. The specific thrust of the research is to explore the strategic, organizational, and innovation implications of different environmental regulatory regimes on corporations through case-study analysis and survey research. A theoretical framework using learning and institutional theory has been developed will be used as the basis of the study.

Approach:

We will conduct an in-depth examination of the management of environmentally conscious technological innovation at E. I. du Pont de Nemours and Company, which has agreed to serve as the corporate partner in this effort. The results from the in-depth analysis of E. I. du Pont de Nemours and Company will be used to develop a survey instrument that will be administered using multiple respondents to a sample of other manufacturers who have made environmental management a major priority. Through this multiple respondent survey, we hope to generalize our results to a larger, more representative group of firms.

The objectives of the research elements to reach the goals are to: 1) refine our theoretical framework that explains the management of technological innovation when subject to different levels of environmental regulation; 2) conduct several case studies of environmentally conscious technological innovations at Du Pont and Conoco that explore the relative influence of environmental regulation on innovation. Case studies will be undertaken in areas that range from a high level of environmental regulation (e.g., CFC substitutes and reformulated gasoline), to areas subject to a lower level of regulation (e.g., polymers, fibers); 3) refine the theoretical framework through in-depth interviews at Du Pont facilities and test the theory through survey data collection at Du Pont, its customers, its regulators, and its suppliers; 4) further refine the survey instrument based on the results of the first survey and administer it to a broad sample of manufacturers for whom environmental management is a stated priority; and 5) develop a management tool that can be used by corporate decision makers as a guide for practical management of innovation that is subject to environmental regulation.

Expected Results:

The expected outputs of the study will be case studies of environmentally friendly technological applications, a decision tool with which managers can improve their environmentally friendly technological innovation efforts and scholarly articles describing the tests of the model discussed above. The study has been designed to yield results that both improve the practice of environmentally friendly technological innovation and to extend our knowledge of the theoretical issues involved.

Progress and Final Reports:

1997 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/632/report/1997

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/632/report/F

Type: STAR GRANT
Status: Completed
Reports: Final

Virulence Factors in *Cryptosporidium* and Infective Dose in Humans

EPA Grant Number: R824759
Title: Virulence Factors in *Cryptosporidium* and Infective Dose in Humans
Investigators: Herbert L. DuPont, Cynthia L. Chappell, Charles R. Sterling, Pablo C. Okhuysen
Institution: University of Texas at Houston , University of Texas Health Science Center-Houston
EPA Project Officer: Dale Manty
Project Period: October 1, 1995 through September 30, 1998
Project Amount: $829,551
Research Category: Human Health Risk Assessment

Description:

The purpose of this project is to determine if isolates of *Cryptosporidium parvum* derived from different hosts and geographic regions differ in virulence. Virulence will be evaluated in vitro by genetic, biochemical and immunological markers and in vivo by mouse infectivity. The infectious dose for humans will be tested in healthy adult volunteers by using isolates that have shown differences in one or more of the laboratory analyses. In addition to establishing an infectious dose (ID50) for each isolate, the cellular and humoral immune responses from each volunteer will be examined. These laboratory and volunteer model studies will reveal the capacity of various isolates to cause infection and disease in humans and to relate those differences to one or more laboratory parameters, thus providing a convenient marker of *C. parvum* pathogenicity. Also, understanding both the common and unique responses involved in the control (clearance) of the infection will allow a rational approach to diagnosis and to the selection of potential candidate antigens for vaccine development.

Conclusions:

1. *Cryptosporidium parvum* genotype 2 oocysts vary widely in their ability to cause infection and illness in healthy persons.

2. Overall, after exposure about 24 percent of infected persons shed oocysts without having a diarrheal illness. Potentially, these individuals would likely be responsible for secondary transmission, especially in non-household settings.

3. Persons who have serological evidence of prior infection (i.e., anti-C. parvum IgG) are relatively resistant to re-infection with low numbers of oocysts, as would be encountered in water sources. However, those who do become infected and develop diarrhea often experience a more severe illness than naive persons.

4. Specific fecal IgA was associated with oocyst shedding and challenge dose in seronegative volunteers exposed to *Cryptosporidium* ostensibly for the first time. In contrast, none of these individuals developed serum IgG.

5. Serum IgG was detected in 33 percent of individuals re-exposed to *Cryptosporidium* oocysts, indicating two or more exposures may be necessary to stimulate a detectable level of specific serum IgG.

6. Serum IgG levels in the "low detectable" range were increased after a subsequent exposure to *Cryptosporidium* oocysts.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/866/report/F

Type: STAR GRANT
Status: Completed
Reports: 1998, Final

Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection

EPA Grant Number: R824770
Title: Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection
Investigators: Stanley B. Grant
Institution: University of California - Irvine , Baylor College of Medicine
EPA Project Officer: Barbara Levinson
Project Period: September 1, 1995 through August 1, 1996
Project Amount: $230,000
Research Category: Water and Watersheds

Description:

Many outbreaks of gastroenteritis occur in the U.S. and these are often caused by waterborne or foodborne transmission of Norwalk virus (NV). Some of these outbreaks can be traced to the contamination of groundwater supplies by inadequate filtration of sewage effluent from private or community septic tank systems. To limit the spread of microbial pathogens through groundwater, the U.S. EPA has proposed a new set of rules under the 1996 reauthorization of the Safe Drinking Water Act that would require public water systems to disinfect source water from each groundwater well unless "natural disinfection" can be demonstrated or a variance can be obtained. With respect to NV, however, the efficacy of these proposed rules is questionable because the environmental variables that control the "natural disinfection" of this particular viral pathogen in subsurface systems are largely unknown.

Approach:

We are utilizing recombinant Norwalk virus (rNV) particles as a model system to overcome the long-standing barrier to conducting filtration experiments with NV. These particles are produced by a molecular biology procedure in which the gene for the single structural protein for NV is cloned into a baculovirus expression system. When the recombinant capsid protein is expressed, it spontaneously self-assembles into virus-like particles (VLPs) that are morphologically and antigenically identical to the native Norwalk virus. The resulting rNV VLPs differ from live NV in only one known but important respect: they lack the genetic material (in particular, RNA) necessary for replication in the host. Thus, while the rNV VLPs "look" like a real Norwalk virus, they are harmless protein particles that cannot initiate infection in humans. The idea behind the current project is to utilize these rNV VLPs, which were originally developed for a new human vaccine, to investigate the natural removal of Norwalk virus in groundwater by physicochemical filtration.

Expected Results:

In the first year of this project, we have completed a set of experiments examining the influence of pore water pH on the surface charge of the rNV VLPs and their filtration rates in packed beds of quartz sand (manuscript submitted for publication). These initial results suggest that pore water pH may be the most important factor in determining the capacity of groundwater systems to provide "natural disinfection" by physicochemical filtration. Ultimately, the rNV VLPs could lead to new approaches for establishing set-back distances between groundwater wells and potential sources of viral pathogens (like groundwater recharge basins and septic tanks) and for assessing the degree to which water contaminated with human waste is "naturally disinfected" by percolation through the subsurface matrix.

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/856/report/1998

Final Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/856/report/F

Type: STAR GRANT
Status: Completed
Reports: 1998, Final

Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection

EPA Grant Number: R824775
Title: Norwalk Virus-Like Particles (VLPs) for Studying Natural Groundwater Disinfection
Investigators: Stanley B. Grant, Mary K. Estes
Institution: University of California - Irvine
EPA Project Officer: Barbara Levinson
Project Period: September 1, 1995 through August 1, 1996
Project Amount: $230,000
Research Category: Water and Watersheds

Description:

Many outbreaks of gastroenteritis occur in the U.S. and these are often caused by waterborne or foodborne transmission of Norwalk virus (NV). Some of these outbreaks can be traced to the contamination of groundwater supplies by inadequate filtration of sewage effluent from private or community septic tank systems. To limit the spread of microbial pathogens through groundwater, the U.S. EPA has proposed a new set of rules under the 1996 reauthorization of the Safe Drinking Water Act that would require public water systems to disinfect source water from each groundwater well unless "natural disinfection" can be demonstrated or a variance can be obtained. With respect to NV, however, the efficacy of these proposed rules is questionable because the environmental variables that control the "natural disinfection" of this particular viral pathogen in subsurface systems are largely unknown.

Approach:

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Expected Results:

In the first year of this project, we have completed a set of experiments examining the influence of pore water pH on the surface charge of the rNV VLPs and their filtration rates in packed beds of quartz sand (manuscript submitted for publication). These initial results suggest that pore water pH may be the most important factor in determining the capacity of groundwater systems to provide "natural disinfection" by physicochemical filtration. Ultimately, the rNV VLPs could lead to new approaches for establishing set-back distances between groundwater wells and potential sources of viral pathogens (like groundwater recharge basins and septic tanks) and for assessing the degree to which water contaminated with human waste is "naturally disinfected" by percolation through the subsurface matrix.

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/601/report/1998

Final Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/601/report/F

STAR
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Type: STAR GRANT
Status: Completed
Reports: Final

Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin

EPA Grant Number: R824799
Title: Water and Sustainable Development in the Binational Lower Rio Grande/Bravo Basin
Investigators: Jurgen Schmandt, Ismael Aguilar Barajas, Daniel J. Sisbarro
Institution: Houston Advanced Research Center
EPA Project Officer: Barbara Levinson
Project Period: November 1, 1995 through January 1, 1998
Project Amount: $400,000
Research Category: Water and Watersheds

Description:

In its 1994 Regional Assessment of Water Quality in the Rio Grande Basin, the Texas Natural Resource Conservation Commission made two recommendations for further research and policy development: 1) an improved understanding of water issues as they relate to the binational border dynamic and 2) development of lasting links across the U.S.-Mexico border. The project unites critical information on water, population, economics, and ecology in an approach that will assist managers and policy decision makers to plan for sustainable management of the binational watershed. The objectives are:

(1) To develop, compare and integrate reliable, comparable watershed-based data sets for the Lower Rio Grande/Rio Bravo Basin.

(2) To analyze water resource issues as critical factors for achieving sustainable development in this type of watershed, and

(3)To engage researchers, policymakers, and the civic community to help answer the questions, "What is needed to make development in the binational watershed more sustainable? And how will we get there?"

Approach:

The project takes a "civic research" approach, integrating data and knowledge from the binational task force of experts and from the broader civic community. We pair Mexican and U.S. researchers to compile and examine data in the areas of: water supply, including quantity and quality; water demands from municipal, industrial, agricultural and ecological users; water management and institutions; instream habitat; and population and socioeconomic growth.

Expected Results:

Findings from our analyses will be used to design a series of community-based surveys and two workshops. The surveys will be conducted by graduate students at the University of Texas and ITESM. These are expected to gather insights into the community's concerns about perceived threats, risks, and opportunities related to water and development in the watershed. The task force will then integrate the survey and science findings in a report which will highlight water and development trends and will recommend actions to be taken to improve the conditions for balancing water and sustainable development needs in the watershed. The task force will also develop a number of future scenarios for the years 2010 and 2030, including drought conditions and sustainable development.

Progress:

As the task force began developing their baseline scenarios for water supply and demand, water quality, water management, socioeconomic factors, and ecology, we determined that we will need more extensive analyses of agriculture, tributaries, and groundwater. In addition, we also need to include a greater diversity of participants in the workshops. The GIS team has produced preliminary maps for the research project, however, there are large gaps in data availability and reliability on the Mexican side. The surveys are stimulating great interest locally because they depart from traditional research methods and people enjoy involvement. The binational task force will meet in February to discuss baseline scenarios. The first future scenario, drought conditions, will be explored in 1997. The first workshop will also be held in 1997, involving civic leaders, water managers, non-profit organizations, and the private sector to rank threats and risks to water and development in the watershed.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/857/report/F

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Type: STAR GRANT
Status: Completed
Reports: Final

Alterations of Water Availability, Water Quality and Fish Habitats in Cold Regions by Climate Change

EPA Grant Number: R824801
Title: Alterations of Water Availability, Water Quality and Fish Habitats in Cold Regions by Climate Change
Investigators: Heinz G. Stefan, Xing Fang
Institution: University of Minnesota , Lamar University - Beaumont
EPA Project Officer: Dale Manty
Project Period: October 1, 1995 through September 30, 1998
Project Amount: $300,000
Research Category: Global Climate Change

Description:

The project goal is to develop and apply computational simulation methods which link hydrology, water quality and fish habitat in lakes and streams to climate conditions. Cold regions and their migration to higher latitudes or altitudes under climate warming are the regional focus of this research. Projected climate warming is expected to have a particularly strong impact on ecosystems and aquatic resources in cold regions, particularly water availability and fisheries.

Approach:

The systematic method of approach has been developed. Water quality is simulated by deterministic, process-oriented, unsteady models. Criteria for fish response to water quality are then used to determine habitat volume or area and fish productivity. The methodology is being extended to winter simulations, i.e., low temperature tolerance criteria for fishes and related ecosystem components. Validation and application is necessary to project changes subsequent to potential global climate change, for example, shifts in fish habitats, the potential for invasion of warmwater fishes into these habitats, the changes in ice conditions, etc.

Progress:

Preliminary results include development of an ice cover submodel which is used in a lake water quality model to project climate change effects on lakes, especially small lakes with surface areas up to 10 km2 and depths up to 24m in the cold regions of the contiguous United States.

The two main parameters studied are lake water temperature (T) and dissolved oxygen (DO) concentration, which are most directly influenced by climate and which in turn have much influence on aquatic lifeforms, water quality, and water uses. Information will be obtained on evaporative water losses from lakes, ice covers on lakes, and sediment temperatures below lakes. The basic simulation results are 19-year averages of daily water temperatures and DO profiles in lakes, ice thicknesses, evaporative water losses, sediment temperatures, etc. From those results more easily interpretable and useful parameters were extracted, e.g., duration of ice cover, water temperature maxima and minima, DO maxima and minima both at the surface and the bottom of a lake. They were related to three independent lake parameters: surface area, maximum depth, and Secchi depth. Maps of the U.S. giving the geographic distribution of each dependent lake parameter were then prepared.

To include climate change effects in the watershed into lake models, the relationship between runoff and climate in two small watersheds in the mid-continental U.S. is being examined. A parametric runoff model has been developed and applied to two watersheds with substantially different climates. For streams the watershed input makes the climate effect more difficult to capture. Mean monthly stream runoff can be simulated well, if four calibration parameters are used for the watershed. Stream temperatures are well correlated with air temperatures at the monthly and weekly timescales.

Through modeling we can quantify how aquatic systems respond to climate, particularly winter changes. The results include, but are not limited to information on cold region lake quality characteristics, streamflows and stream temperatures, periods and thicknesses of ice covers. The results so far show that one can model climate effects on significant lake water quality parameters. Overall the results indicate that simulations can proceed to fish habitat and water availability estimates.

In the next steps, the lake simulations need to be validated in one or two other regions, and then the 2xCO2 climate scenario needs to be applied at the continental scale. The fish habitat parameters need to be extracted from the temperature and DO simulation results. Upper thermal tolerance criteria need to be applied for coldwater and coolwater fish species. Lower thermal tolerance criteria need to be developed for warmwater fish species.

Expected Results:

In the final analysis, the responses to the 1xCO2 (past) and 2xCO2 climate scenario can be compared and an assessment of potential climate change effects can be given.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/123/report/F

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Type: STAR GRANT
Status: Project Period Concluded
Reports: No Reports Available Yet

Reversible Inactivation of Viruses in Groundwater

EPA Grant Number: R824875
Title: Reversible Inactivation of Viruses in Groundwater
Investigators: Maria E. Alvarez, Surresh Pillai
Institution: El Paso Community College , Texas A&M Agricultural Research and Extension Center
EPA Project Officer: Virginia Broadway
Project Period: September 15, 1996 through September 14, 1998
Project Amount: $176,939
Research Category: Minority Institutions

Description:

Viral contamination of surface and groundwater is a potential problem along the U.S.-Mexico Border, which deserves to be studied in detail using a variety of approaches. Mexican border communities lacking sewage treatment plants discharge untreated sewage into the Rio Grande. Also, the existence of "colonias" lacking potable water and sewage facilities on both sides of the border contributes to the possibility of fecal contamination of groundwater. Since the U.S.-Mexico Border area share their water supplies, an accurate assessment of the extent of viral contamination from fecal origin is of paramount importance. Preliminary data indicates that viruses can exist in groundwater in a state that could be referred to as reversibly inactivated. The existence of such viral particles can lead to underestimation of viral numbers since changes in environmental conditions like temperature, pH, ionic composition, or chemical discharges form maquiladora plants from other sources could lead to viral reactivation. Although information exists on the inactivation kinetics of a variety of viruses in surface and groundwater, to understand the nature of viral reactivation is vital to determine the mechanisms of viral inactivation in water a the molecular level.

Approach:

The specific objectives of the proposed project will be: 1) to determine the mechanisms of inactivation of model viruses like MS2 coliphage and poliovirus type 1 in groundwater by correlating percent inactivation values with structural and compositional changes associated with the viral capsid and/or RNA; and 2) to determine whether the viral particles that have entered the reversibly-inactivated state could become infectious and to identify environmental factors such as temperature, pH and ionic composition that could promote or retard the process.

Expected Results:

Data on viral inactivation/reaction mechanisms and the environmental factors that affect these phenomena will help explain the contradictory results found in the literature on the efficiency of disinfection procedures on a variety of viruses like HIV and Hepatitis A, and will provide guidelines for the development of more effective methods for detection and enumeration of viral contaminants found in natural and treated water systems.

Type: STAR GRANT
Status: Completed
Reports: 1999, 2000, Final

Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.

EPA Grant Number: R824997
Title: Sensitivity Analysis of the Effect of Changes in Mean and Variability of Climate on Crop Production and Regional Economics in the Southeastern U.S.
Investigators: Linda Mearns, R. Katz, S. Thompson, R. Adams, B. McCarl, B. Easterling, G. Carbone
Institution: National Center for Atmospheric Research , Oregon State University , Texas A & M University , University of Nebraska at Lincoln
EPA Project Officer: Dale Manty
Project Period: November 1, 1996 through October 31, 1999
Project Amount: $1,200,901
Research Category: Ecological Restoration

Description:

This project investigates the effects of changes in interannual (and daily) climatic variability (including changes in ENSO event frequency and persistence), on crop production in the Southeastern U. S. The investigators will also determine the difference in crop response to two different types of future climate?one from a control and doubled CO2 experiment of a high resolution regional climate model; and another based on the results of a fully coupled transient experiment of the GENESIS climate model.

Approach:

The project will combine stochastic modeling of interannual climate variability, transient GCM modeling, high resolution regional climate modeling, application of crop models, and regional economic modeling. This work will build on a regional modeling study that is currently underway, funded by the U. S. Environmental Protection Agency, whereby high resolution (approx. 50 km) control and doubled CO2 runs will be produced. These runs will be used as a baseline climate scenario and apply them to crop models (i.e., CERES and CROPGRO family of models). Two types of scenarios will be developed from these runs: one including only mean changes in the relevant climate variables and another including both mean and daily variability changes.

The investigators will also construct guided sensitivity studies of changes in the frequency of El Nino/Southern Oscillation (ENSO) and North Atlantic Oscillation (NAO) events relevant to the region, through examination of both indications of past changes in ENSO events and the most recent results of coupled climate model transient experiments. These changes will be stochastically simulated and applied to the crop models. The investigators will also use the detailed results of a soon to be completed transient run directly to form an additional scenario. Statistical downscaling techniques will be used to create higher resolution as well as more reliabel results from the GCM. Resulting changes in yield from the different scenarios will provide input to an agricultural sector economic model for evaluation of economic sensitvity to the different sets of yield changes.

Expected Results:

The results of this project will provide valuable information on the possbile sensitivity of agriculture in the Southeastern region of the United States to a range of possible climate changes, and ultimately the sensitivity of the regional economy to these perturbations in agricultural production.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/239/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/239/report/2000

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/239/report/F

Type: STAR GRANT
Status: Completed
Reports: 1997, 1999, Final

Modeling Spatial and Temporal Dynamics of Montane Meadows and Biodiversity in the Greater Yellowstone Ecosystem

EPA Grant Number: R825155
Title: Modeling Spatial and Temporal Dynamics of Montane Meadows and Biodiversity in the Greater Yellowstone Ecosystem
Investigators: Diane Debinski, Mark Jakubauskas, Kelly Kindscher
Institution: Iowa State University , University of Kansas Main Campus , University of Oklahoma Norman Campus
EPA Project Officer: Barbara Levinson
Project Period: October 1, 1996 through September 30, 1999
Project Amount: $709,640
Research Category: Ecological Restoration

Description:

Understanding the factors which control the spatial distribution of biological diversity requires an intimate knowledge of the interaction between a landscape's composition and its physiognomic arrangement. We propose to model ecological dynamics in the Greater Yellowstone Ecosystem (GYE), concentrating specifically upon the spatial and temporal dynamics of montane meadow communities. Furthermore, we will examine the effects of this habitat variability upon plant, bird and butterfly biodiversity. The GYE is an excellent area for assessment of environmental change because it is one of the largest intact ecosystems in the continental U.S. and is as pristine a site as can be found in the lower 48 states.

This research project is part of an ongoing effort that began in 1993. Our long-term goal was to develop predictive species assemblage models based upon landscape level habitat analysis. This involved using intensive, local field sampling to test for relationships between species distribution patterns and remotely sensed data. Statistically significant relationships were found between remotely sensed data and a large number of plant and animal species in the northern GYE. Our next goal is to test the predictability of our models at different spatial scales and in a region that is 200 miles south. Specifically our objectives are to: 1) quantify the spatial and temporal variability in montane meadow communities; 2) develop a spectrally-based spatially-explicit model for predicting plant and animal species diversity patterns in montane meadows; and 3) test the spectrally-based spatially-explicit model for predicting plant and animal species diversity patterns in montane meadows.

Montane meadow communities can function as early indicators of change because they are highly sensitive to variations in precipitation and temperature. However, before an accurate estimation of directional change rates may be made with confidence, the seasonal and interannual rates of change inherent to a system must be quantified. We will use a time series of satellite multispectral imagery for monitoring the extent, condition, and spatial pattern of montane meadows on a seasonal and interannual time scale. Spectrally-based, spatially-explicit models will be developed for six meadow types using a GIS to stratify the study area by topography and geology.

Approach:

The innovative aspects of this research are: 1) using remotely sensed data to predict biodiversity across a landscape, as opposed to predicting single species presence or absence; 2) using fine-scale data to predict other locations of species; and 3) development of a model for detecting sites of high species diversity and potential habitats of rare species that could be applied to other ecosystems.

Expected Results:

The outcome of this research will be a mechanism for estimating and monitoring species distribution patterns at a landscape scale. We expect that species that exhibited statistically significant relationships with remotely sensed habitat types during 1993-1995 will show the strongest relationships in the southern GYE. We also expect that mesic meadows will be the sites of highest species diversity and the sites of highest seasonal and interannual change.

Relevant Websites:

http://www.public.iastate.edu/~debinski/homepage.html

http://www.kars.ukans.edu

http://www.public.iastate.edu/~mobes/aeclgis2.html

Progress and Final Reports:

1997 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/236/report/1997

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/236/report/1999

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/236/report/F

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Type: STAR GRANT
Status: Completed
Reports: 1999, Final

Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media

EPA Grant Number: R825207
Title: Partitioning Algorithms and Their Applications to Massively Parallel Computations of Multiphase Fluid Flows in Porous Media
Investigators: Richard E. Ewing, Hristo Djidjev, Raytcho D. Lazarov
Institution: Texas A & M University , Rice University
EPA Project Officer: Chris Saint
Project Period: November 1, 1996 through October 31, 1999
Project Amount: $290,760
Research Category: High-Performance Computing

Description:

This project focuses on the development of efficient methods for parallel simulation of multiphase flows in porous media. Such flows are mathematically described by linear and nonlinear parabolic or elliptic initial boundary-value problems whose solution are based on standard and mixed finite element approximations and require enormous computational resources. The goal of this project is to design and analyze adaptive grid refinement methods and partitioning methods that lead to accurate approximation schemes and scalable parallel algorithms.

Approach:

The adaptive finite element methods will be based on optimal local error estimators and indicators. The partitioning methods will be based on efficient algorithms for graph separation and will allow an optimal parallelization of the computation, which computational load balanced over the processors and with communication costs minimized.

Expected Results:

The results of this research can be applied to multiphase multicomponent flows in porous media and in particular, in detection and control of chemicals' movement in the soil due to agricultural activities, in the design and evaluation of remediation technologies, water quality control, and other environmental problems.

Relevant Websites:

http://www.isc.tamu.edu/EPA/EPA.html

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/719/report/1999

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/719/report/F

STAR Science to Achieve Results

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Type: STAR GRANT
Status: Project Period Concluded
Reports: No Reports Available Yet

Mercury as an Insulin Mimic: Mechanism of Action and Potential Physiological Consequences

EPA Grant Number: R825218
Title: Mercury as an Insulin Mimic: Mechanism of Action and Potential Physiological Consequences **Investigators:** David M. Barnes
Institution: University of Arkansas at Fayetteville
EPA Project Officer: Dale Manty
Project Period: November 15, 1996 through November 14, 2001
Project Amount: $481,991
Research Category: Early Career Awards

Description:

Polypeptide hormones are important in the regulation of many metabolic processes; however, little is known regarding the ability of environmental pollutants to disrupt polypeptide hormone action. Although information regarding the hormone-like effects of heavy metals is limited, preliminary data reveal that mercury induces hexose transport and increases protein synthesis with patterns, magnitudes, and kinetics identical to those of insulin. Mercury's insulin-like effects and extended half-life in the body may lead to a chronic stimulation of the insulin signal transduction pathway which either may initiate or prevent the normal feedback mechanisms that regulate insulin responses. Alterations of these normal feedback mechanisms could result in a long-term modulation of insulin responsiveness.

This project hypothesizes that mercury acts as an insulin-mimic which initiates insulin-like effects by specifically activating insulin-responsive signal transduction pathways, thus, providing an environmental component which leads to the downregulation of insulin-mediated effects. This hypothesis will be addressed with the following objectives: 1) to compare the effects of mercury and insulin on hexose transport and protein synthesis in hepatocyte, adipocyte, and skeletal muscle cell lines, representing the tissues involved in glucose homeostasis; 2) to determine the signal transduction pathway(s) targeted by mercury to induce its insulin-like effects; and 3) to determine if prolonged exposure to mercury induces cells to become nonresponsive to subsequent stimulation with insulin.

These objectives will be addressed by following the uptake and the incorporation of radiolabelled tracers and by analyzing the biochemical effects of mercury on insulin-stimulated signal transduction enzymes. This study will further our understanding of the insulin-like effects of mercury its potential to disrupt insulin regulated metabolism. Moreover, these results will contribute to a better understanding of the ability of xenobiotics to function as hormone-mimics and may contribute to an understanding of the role of environmental factors in the induction of diseases or dysfunctions associated with insulin nonresponsiveness.

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1997, 1999

Geophysical Sensing in Environmental Applications: Efficient Numerical Simulations

EPA Grant Number: R825225
Title: Geophysical Sensing in Environmental Applications: Efficient Numerical Simulations
Investigators: Qing-Huo Liu
Institution: Duke University
EPA Project Officer: Dale Manty
Project Period: November 21, 1996 through September 20, 2001
Project Amount: $500,000
Research Category: Early Career Awards

Description:

The objective of this research is to develop efficient forward and inverse techniques to model electromagnetic and acoustic problems in environmental geophysical sensing. Specifically, fast forward and inverse computer models will be developed for electrical resistance tomography (ERT), electromagnetic induction (EMI), radio imaging methods (RIM), surface seismic reflection, and borehole seismic imaging measurements in three-dimensional inhomogeneous media.

In environmental geophysical sensing, electromagnetic and acoustic sensors are used on the earth's surface or in boreholes to probe the complex underground medium. The interpretation of these important measurements remains a challenging problem because of the complex interaction of waves with the underground medium. Simulating realistic three-dimensional models encountered in these problems can easily exceed the capacity of any modern supercomputer if conventional methods are used. Therefore, there is a pressing demand for more efficient forward and inverse techniques. These forward and inverse solutions are also critical in processing the collected data and in computer-aided design of new measurement systems.

For time-harmonic electromagnetic problems, including those for ERT, EMI, and RIM systems, special methods such as numerical mode-matching techniques and spectral-domain techniques will be explored to solve large three-dimensional forward problems. These techniques will allow one to solve much larger problems than conventional finite-difference and finite-element methods. For transient electromagnetic and acoustic problems, new absorbing boundary conditions for finite-difference methods with nonuniform grids will be developed to solve wave propagation problems efficiently.

The ultimate goal of this program is to solve the nonlinear inverse problems, i.e., to infer the material properties from a set of measured data. The coupling between efficient forward solutions and the inverse algorithms is critical for these large-scale inverse problems.

This research will significantly advance the capability of simulating large-scale forward and inverse electromagnetic and acoustic problems in environmental geophysical sensing. The computer programs developed can be used to enhance the understanding of complicated wave interactions in the underground medium, and to improve the interpretation and processing capability of electromagnetic and acoustic measurements in complex environments.
With the fast and accurate modeling programs, researchers will be able to provide useful information regarding underground objects, leaks, and discontinuities in a timely manner. With the modeling capability, remediation of waste sites will become much better, safer, and less costly.

Progress and Final Reports:

1997 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/849/report/1997

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/849/report/1999

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1997, 1998

Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area

EPA Grant Number: R825241
Title: Measurement and Source Apportionment of Human Exposures to Toxic Air Pollutants in the Minneapolis - St. Paul Metropolitan Area
Investigators: Greg Pratt, Ken Sexton, Lance Waller, Tom Stock, M. Marbury, Gurumurthy Ramachandran
Institution: Minnesota Pollution Control Agency , Minnesota Department of Health , University of Minnesota
EPA Project Officer: Stacey Katz, Gail Robarge
Project Period: February 10, 1997 through February 9, 2000
Project Amount: $553,658
Research Category: Ambient Air Quality

Description:

This research project will take an integrated, multi-disciplinary approach to measuring and apportioning the sources of human exposures to an array of volatile organic compounds (VOCs). The study will accomplish these objectives by combining a variety of complementary approaches, methods, and techniques, including: (a) a complete emission inventory of point, area, and mobile sources in the Twin Cities metropolitan area; (b) dispersion modeling to estimate ambient VOC and PM10 concentrations in three different communities within the metropolitan area and at 20 individual residences within each community; (c) central-site monitoring in the general metropolitan area to measure ambient VOC and metal concentrations; (d) central-site monitoring in each of three study communities to measure ambient VOC and metal concentrations; and (e) passive monitoring to measure ambient VOC concentrations outside residences, indoor air concentrations inside residences, and personal exposures for 20 people in each of the three study communities. These data will allow us to apportion both the relative contributions to measured personal exposures of indoor versus outdoor concentrations, and the relative contributions to measured ambient concentrations of point, area, and mobile sources. The data will also allow us to test the reliability of central monitors, community monitors, and modeling as predictors of personal exposure. The results from this study will directly improve the realism of health risk assessments for toxic air pollutants and help to inform policy choices about effective (e.g., protective) and efficient (e.g., cost-effective) control strategies. In addition, because we will be measuring exposures to several air toxics simultaneously, the study will provide valuable insights into the potential risks posed by exposures to air pollution mixtures.

Progress and Final Reports:

1997 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/704/report/1997

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/704/report/1998

Type: STAR GRANT
Status: Completed
Reports: Final

Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer

EPA Grant Number: R825280
Title: Interindividual Variations in Genetic Polymorphisms as Risks for Colorectal Cancer
Investigators: Nicholas P. Lang, Fred Kadlubar, Stewart MacLeod, Lynn Frame, Craig Stotts, Christine Ambrosone
Institution: University of Arkansas for Medical Sciences , National Center for Toxicology Research
EPA Project Officer: David H. Reese
Project Period: November 15, 1996 through November 14, 1999
Project Amount: $538,785
Research Category: Role of Individual Variation in Human Susceptibility to Cancer

Description:

Recent evidence has demonstrated that predictions of cancer risk must take into account not only carcinogen exposure but also interindividual variations in the ability to activate or detoxify specific carcinogens. This project is a case-control study of risk associated with various genotypes and exposures in the development of colorectal cancer. Two objectives will be investigated: (1) whether interindividual differences in susceptibility to colon cancer are related to genetically based differences in the polymorphic enzymes responsible for the activation and detoxification of heterocyclic aromatic amines and bicyclic aromatic amines (found in cooked foods, tobacco smoke, and several environmental sources), and (2) whether genotyping provides additional and/or better data that indicate a quantitative relationship between polymorphisms and the risk for colorectal cancer development in those patients for whom phenotyping and environmental exposure data already exists. PCR-based assays will be used to determine the genotype of study subjects for specific polymorphisms that have been linked to the activation or detoxification of these carcinogenic amines. These data will be combined with phenotype data and environmental exposure data for the same study subjects. It is expected that interindividual differences in susceptibility to colorectal cancer will be determined by both the level of exposure to potentially carcinogenic amines as well as by differences in the ability to metabolize these carcinogens. The results will facilitate the identification of individuals who are at increased risk for colorectal cancer due to genetically based differences in their ability to metabolize potentially carcinogenic amines, thus setting the stage for developing better health policies and more accurate exposure limits for these compounds.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/33/report/F

Type: STAR GRANT
Status: Completed
Reports: Final

An in vivo Model for Detection of Reproductive Effects of Endocrine Disruptors

EPA Grant Number: R825298
Title: An in vivo Model for Detection of Reproductive Effects of Endocrine Disruptors
Investigators: David E. Hinton, Barbara S. Washburn, Swee J. Teh
Institution: **University of California - Davis** , University of Texas at El Paso
EPA Project Officer: David H. Reese
Project Period: November 1, 1996 through October 31, 1999
Project Amount: $519,729
Research Category: Endocrine Disruptors

Description:

The objective of this research is to develop and validate a short term in vivo model, using the small teleost fish medaka, Oryzias latipes, to identify adverse effects of exposure to endocrine-disrupting chemicals.

Approach:

Reproductive endocrine dysfunction at the individual level will be emphasized. The most sensitive developmental window for exposure to endocrine disruptors (ED) will be identified using estradiol or androgen. Subsequently, appropriate exposure levels for two test compounds, octylphenol (OP), a xenoestrogen, and vinclozolin (V), an anti-androgen, will be determined. Effects on reproduction, will include mating behavior, sperm number and motility, egg number and quality, sex ratio, and liver and gonadal histology. Physiological and pathological changes in the liver and gonads will be correlated with reproductive success, embryo survival, and viability of fry. Effects of long term ED exposure outside the window of sensitivity will also be studied. Eggs produced by crossing exposed and unexposed female and male fish will be incubated and the development and reproductive success of the fry followed (P1 generation). To further validate the model, different EDs with known but different mechanisms of action will be investigated during the most sensitive development stage.

Expected Results:

If adverse effects are associated with exposure, further study will be performed.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/138/report/F

27

Type: STAR GRANT
Status: Completed
Reports: Final

Chemical Plant Wastewater Reuse and Zero Discharge Cycles

EPA Grant Number: R825328
Title: Chemical Plant Wastewater Reuse and Zero Discharge Cycles
Investigators: Miguel J. Bagajewicz
Institution: University of Oklahoma Norman Campus
EPA Project Officer: Barbara Karn
Project Period: October 1, 1996 through September 30, 1999
Project Amount: $224,977
Research Category: Technology for a Sustainable Environment

Description:

The purpose of this project is to develop methodologies for the design and/or retrofit of environmentally benign water cycles in chemical processing units.

Approach:

To address the design and retrofit task, the State Space Approach will be used. This method has been successfully used to combine heat and mass exchanger pinch calculations in a single optimization technique, departing from inefficient sequential methods. The State Space approach can also enlarge the scope of the studies to consider process changes that may allow better pollutant interception. The concept of zero water discharge refers to closed circuits of water, where water disposal is eliminated altogether. Closed circuits are appealing because end-of-pipe regeneration does not have to be conducted to the full extent required for disposal as water can be reused with higher level of contaminants. Additionally, the absence of a discharge eliminates internal administrative costs associated with the enforcement of EPA and local limits, as well as the interface with government agencies.

Expected Results:

This project will have a significant impact on water usage and wastewater management for the chemical and petrochemical industry.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/133/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1999

Novel Nanocoatings On Cutting Tools For Dry Machining

EPA Grant Number: R825339
Title: Novel Nanocoatings On Cutting Tools For Dry Machining
Investigators: Ranga Komanduri, Frank Kustas
Institution: Oklahoma State University - Main Campus, Technology Assessment & Transfer Inc
EPA Project Officer: Barbara Karn
Project Period: October 1, 1996 through September 30, 1999
Project Amount: $180,000
Research Category: Technology for a Sustainable Environment

Description:

This project is jointly funded by NSF and EPA. In this project we propose to investigate two novel technologies in an attempt to accomplish clean manufacturing. The development of new cutting tool materials based on novel multilayer nanocoating architectures of carbide/metal or solid lubricant/metal on cemented carbide tools by closed field unbalanced magnetron sputtering (CFUMS) process is the first novel technology. In contrast to the conventional Chemical Vapor Deposition (CVD) coating process, CFUMS process enables the production of exceptionally high quality, high density Physical Vapor Deposition (PVD) coatings. This is environmentally a clean process where no chemicals or harmful by-products are present unlike in CVD. The second novel technology is the use of the nanolayer coated tools in dry machining which makes it an environmentally friendly manufacturing.

Approach:

Research tasks will be inducted separately for NSF and EPA. The research will concentrate on the hard and tough multilayer coatings (Class I) on cutting tools for dry machining for the NSF part and on low friction (tribological) coatings (Class II) on cutting tools for dry machining for the EPA part. Similarly research will be conducted on B_4C/W, SiC/W,B_4C/SiC (Class I) systems for the NSF and MoS_2/Mo, WS_2/W, and TaS_2/Ta (Class II) systems for the EPA part. These coatings will be characterized by low angle x-ray diffraction, optical, SEM, AES, nanoindentation, and Rivet test for adhesion. The nature of coating will also be studied using an instrumented *in situ* SEM tribometer designed and built at OSU. The machining performance of these coated tools will be evaluated selectively in turning, milling, and drilling using instrumented set ups. Tool life and tool wear studies will be conducted over a range of cutting speeds using the characterization techniques proposed earlier. TA&T will deposit nanocoatings in consultation with OSU and characterize the physical and microstructural properties of the films produced. OSU will conduct most of the cutting studies. TA&T will also send some tools to potential users for evaluation.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/131/report/1999

Type: STAR GRANT
Status: Completed
Reports: 1999, 2000, Final

Field-Usable Compact Capillary Based Liquid/Ion Chromatographs - Real Time Gas/Aerosol Analyzers

EPA Grant Number: R825344
Title: Field-Usable Compact Capillary Based Liquid/Ion Chromatographs - Real Time Gas/Aerosol Analyzers
Investigators: Purnendu K. Dasgupta
Institution: Texas Tech University
EPA Project Officer: Bill Stelz
Project Period: October 15, 1996 through October 14, 1999
Project Amount: $333,141
Research Category: Monitoring Program on Ecological Effects of Environmental Stressors Using Coastal Intensive Sites

Description:

Ion and liquid chromatography are two of the most widely used techniques in environmental analysis. Both remain relegated to the laboratory due to the lack of truly portable and robust equipment. Based on a considerable amount of preliminary work, we propose here the development of briefcase sized packed capillary and open tubular ion/liquid chromatographic instrumentation of weight under 20 lb.

Approach:

All operation control and data acquisition will be carried out by a laptop personal computer. The instrument will be capable of operating off AC power, or for 8h from four flatpack NiMH batteries. Both suppressed conductometric and optical detectors will be developed. These instruments will operate at single digit μL/min flow rates, using very little consumables and generating very little waste. Chromatographic efficiencies will equal or exceed those of present day conventional size benchtop instruments. Two complete systems will be built.

Expected Results:

These chromatographs will be coupled to wetted denuders (for the collection of soluble ionogenic gases) and bead packed wetted coils (for the collection of aerosols) to devise a new generation of near-continuous gas/aerosol analysis instrumentation that are expected to be not only far more compact but also substantially more sensitive (sub-ppt for most gases, pg/m^3 for most aerosol constituents) than their previous counterparts. These will be field tested by ourselves and also in collaboration with the National Center for Atmospheric Research. (NCAR). The inexpensive syringe pump driven gradient LC system will be field tested for pesticide analysis in runoffs from local cotton fields.

Relevant Websites:

http://www.ttu.edu/~chem/faculty/dasgupta/dasgupta.html

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/533/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/533/report/2000

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/533/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: No Reports Available Yet

Spatial and Temporal Patterns of Larval Fish Morphometrics as Indicators of Ecosystem Health

EPA Grant Number: R825350
Title: Spatial and Temporal Patterns of Larval Fish Morphometrics as Indicators of Ecosystem Health
Investigators: James H. Power
Institution: Louisiana State University - Baton Rouge
EPA Project Officer: Dale Manty
Project Period: December 15, 1996 through December 14, 1999
Project Amount: $165,436
Research Category: Environmental Biology

Description:

The estuarine larvae of fish are a critical component of those ecosystems they are important forage for other organisms, and if they survive to the juvenile-adult stage they in turn comprise one of the top predators in the ecosystem as well as an important resource for man. During the larval phase these animals exhibit both extremely high growth rates and high mortality rates. Slight fluctuations in the early mortality rate can result in considerable variations in adult population size, with obvious ecosystem consequences. This concept, combined with the rapid growth and development of larval fish, make them a sensitive indicator of ecosystem health. This project is to examine the morphometrics of larval estuarine fish, and to collect information on the magnitude of variation, and spatiotemporal patterns of variability, by an advanced measure of larval fish condition. Its objective is to answer the following questions: 1) What is the inherent variability of field-collected larval fish condition as quantified by morphometric measures, coupled with accurate measures of live fish body mass and body volume?, and 2) Are there spatial or temporal patterns of these morphometric condition indices that can be related to estuarine location or time of year? Are there locations along an environmental gradient within the estuary where larvae are consistently and quantifiably "better," or at least different?

The centerpiece of this research is to examine the patterns of larval shape using a new and exciting analytical approach the thin-plate spline-relative warp analysis. This analysis has been proven to be capable of extracting and quantifying subtle patterns of affine (uniform) and non-linear variations in biological shape. This analysis will be complemented with accurate measures of live larval body mass and volume, using a weight-in-water measurement technique based on Archimedes' principle. This project is expected to demonstrate, and quantify, variations in larval shape among a variety of habitats in the Louisiana Barataria-Terrebone estuarine system, a component of the EPA National Estuary Program. Understanding spatiotemporal patterns of larval morphometric condition indices will help: (1) to reveal ecosystem function by allowing identification and characterization of attributes responsible for that status; and (2) to anticipate the consequences of early assessment of good or impaired condition, and especially to know the subtle effects of anthropogenic change such as pollution or habitat modification.

Type: STAR GRANT
Status: Completed
Reports: 1997, 1998, Final

Microbial Monitoring With Artificial Stable RNAs

EPA Grant Number: R825354
Title: Microbial Monitoring With Artificial Stable RNAs
Investigators: George E. Fox, Richard C Willson
Institution: University of Houston
EPA Project Officer: Dale Manty
Project Period: January 1, 1997 through December 31, 1999
Project Amount: $335,701
Research Category: Environmental Biology

Description:

The purpose of this project is to establish a stable RNA-based approach for labeling and tracking microorganisms in complex ecosystems. This technology will be readily incorporated into studies of risk associated with the release of both naturally occurring and genetically engineered bacteria into the environment. The monitoring system will also be an extremely valuable tool for monitoring organism behavior in laboratory studies of microbial ecosystems.

Previously, we have developed a recombinant DNA vector which encodes a deletion mutant of 5S rRNA. This deletion RNA is expressed from the growth rate-regulated ribosomal RNA promoters and accumulates to high levels. The resulting system is in effect a miniature rRNA operon and is referred to as rrnMINI. Site-directed mutagenesis was used to create a restriction site in the deletion RNA gene in order to facilitate the addition of replacement sequences. By appropriate insertion of replacement sequences into this construct novel RNAs which carry highly unique sequence segments can be created. These artificial RNAs (aRNAs), are not incorporated into ribosomes but nevertheless accumulate to high levels in the cell. Three alternative approaches might be useful for detecting such aRNAs. These are: (1) the presence of a unique size band in a high resolution low molecular weight RNA gel profile, (2) presence of a unique target sequence in the aRNA that can be detected by any of several hybridization strategies, and (3)incorporation of a mRNA in the aRNA that encodes a readily detectable protein product, e.g., the Green Fluorescent Protein.

In contrast to more traditional methods, detection based on the rrnMINI system will not depend on recovery of the organisms of interest in viable/culturable form, and it does not confer new capabilities such as drug resistance on the labeled organism. The reliance on a growth rate regulated promoter is an advantage not enjoyed by amplification (PCR) and direct detection (e.g., bioluminescence), approaches that are currently in use. In addition, potential problems associated with selective target amplification are avoided.

Additional exploratory research is being conducted to increase the suitability of this promising rrnMINI technology for use in microbial monitoring and risk assessment. The current system is plasmid based in *E. coli*. In order to minimize undesired spread of recombinant genes in the environment it is anticipated that whenever possible one will either use large plasmids, e.g., Tol, or directly integrate recombinant genes into the main genome. Therefore it will be essential to integrate the rrnMINI expression system into potential host organisms. In the present study this will be undertaken for *E. coli, P. putida* and the Tol plasmid. These efforts will be facilitated by minor improvements in the existing aRNA identification system. A second major project goal will be to carefully characterize at least one approach to aRNA detection.

Progress and Final Reports:

1997 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/527/report/1997

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/527/report/1999

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/527/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1997, 1999

Developing a New Monitoring Tool for Benthic Organisms in the Gulf of Mexico: Loss of Genetic Variability in Meiofaunal Populations

EPA Grant Number: R825355
Title: Developing a New Monitoring Tool for Benthic Organisms in the Gulf of Mexico: Loss of Genetic Variability in Meiofaunal Populations
Investigators: Paul A. Montagna
Institution: University of Texas at Austin
EPA Project Officer: Dale Manty
Project Period: December 1, 1996 through November 30, 1998
Project Amount: $243,469
Research Category: Environmental Biology

Description:

A loss of genetic variability in populations of Harpacticoida (Copepoda) has been observed with proximity to offshore hydrocarbon production platforms. The loss of genetic diversity was concordant with increased levels of heavy metal contaminants, but this is confounded with the reef-like nature of a platform. Populations can differentiate when a habitat barrier exists or if there are selection pressures due to habitat influences (e.g., selective fish predation, or different sediment grain size). However, contaminants can act as a selective force. Under strong natural selection, as a population shifts towards a new fitness peak, less-fit phenotypes and their associated genotypes, can disappear, resulting in an overall loss of genetic variability. The purpose of this project is to develop a complete understanding of the cause of genetic variability loss near offshore hydrocarbon platforms.

Two experiments will be performed to isolate the confounding contaminant and reef effects. A field experiment will compare population structure at artificial reefs (inactive platforms without contamination), sites where platforms were removed (no reef but contaminants still exist), and operating platforms (reef and contaminant effects). A second experiment will consist of a series of exposure experiments to specific contaminants (e.g., heavy metals, that exist at high levels at production platforms) over three generations to demonstrate that contaminants can cause selection. Levels of sediment contaminants will be measured in both the field and laboratory experiments. Genetic variability in populations will be measured using restriction fragment length polymorphisms of 16S mitochondrial DNA. Mitochondrial DNA is useful in population studies because it has a high divergence rate. It is also maternally inherited, thereby eliminating recombination events.

Five species of harpacticoids will be studied, and at least 30 individuals per station will be analyzed to calculate the haplotype diversity index. The results of this study will demonstrate that selection can occur by chronic, sublethal exposure to contaminants associated with offshore production platforms and this can cause populations to lose genetic variability. If selection by contaminants is a general phenomenon, then this would have broad management implications and support the use measuring population structure at the molecular level as an ecological monitoring tool.

Relevant Websites:
http://www.utmsi.utexas.edu/staff/montagna

Progress and Final Reports:

1997 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/534/report/1997

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/534/report/1999

Type: STAR GRANT
Status: Completed
Reports: 1997, 1998, Final

A Multi-Scale Investigation of Mass Transfer Limitations in Surfactant-Enhanced Aquifer Remediation

EPA Grant Number: R825405
Title: A Multi-Scale Investigation of Mass Transfer Limitations in Surfactant-Enhanced Aquifer Remediation
Investigators: Alex Mayer, Gary A. Pope
Institution: Michigan Technological University , University of Texas at Austin
EPA Project Officer: Bill Stelz
Project Period: October 1, 1996 through October 31, 1999
Project Amount: $299,792
Research Category: Environmental Fate and Treatment of Toxics and Hazardous Wastes

Description:

Significant progress has been made in the application of surfactants to enhance remediation of aquifers contaminated by nonaqueous phase liquids (NAPLs). The addition of surfactant lowers the interfacial tension between the NAPL and water and also increases the solubility of the organic contaminants in the water. Solubility enhancement is the primary mechanism for removing dense NAPLs (DNAPLs), such as chlorinated solvents. However, almost all of the work on surfactant enhanced remediation of NAPL contamination has assumed that local equilibrium exists between the NAPL and the aqueous/surfactant solution. Although a few studies have shown that equilibrium may not always occur, very little work has been conducted to determine the conditions where mass transfer limitations are important for these systems. Mass transfer limitations have the effect of slowing the rate of NAPL removal by the surfactant solution.

The goal of the proposed work is to investigate mass transfer between residual NAPLs and aqueous phases containing surfactants. The investigation will yield mass transfer relationships for surfactant-enhanced NAPL dissolution. The dependence of mass transfer rates on remediation design variables surfactant constituents, types and concentrations and aqueous phase flow rates will be determined. The proposed work also will attempt to identify the phenomena responsible for mass transfer limitations in surfactant-enhanced NAPL dissolution, such as the viscosity of aqueous-surfactant solutions, diffusivities in aqueous-surfactant solutions, mass exchange from NAPL to aqueous solutions, and mass exchange from aqueous solution to micelles.

Approach:

The development of the mass transfer relationships will occur at three scales: the pore scale, macroscopic scale (1-10 cm), and meso scale (10-100 m). First, laboratory column tests will be conducted to determine macroscopic mass transfer rate coefficients. The column tests will yield mass transfer rates as a function of aqueous phase velocities and surfactant types, dosages, and constituents. Next, residual NAPL dissolution will be simulated at the pore scale using a modified pore scale simulator. The averaged mass transfer rates produced in the pore scale model will be calibrated to the laboratory results. The calibrated parameters will include effective diffusivities and NAPL/aqueous phase/micellar mass exchange rates. Lastly, the macroscopic mass transfer rate coefficients will be incorporated into a continuum-based model for simulating NAPL dissolution at the meso scale.

Expected Results:

This project will result in a greater understanding of the chemical processes involved in enhanced remediation processes. This improvement will occur by developing mass transfer rates that have been derived from pore-scale phenomena and are described as a function of variables that are relevant to remediation design aqueous phase flow rates and surfactant properties. A greater understanding of mass transfer limitations will result in more intelligent design of surfactant enhanced remediation, e.g., surfactant dose, type, constituents, and application rates, which presumably will result in more cost-effective remediation efforts. In addition, the improved understanding expected from the proposed work could result in the development of site selection criteria for surfactant-enhanced aquifer remediation.

Progress and Final Reports:

1997 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/684/report/1997

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/684/report/1998

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/684/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1997, 1998, 1999

Bioavailability & Risk Assessment of Complex Mixtures

EPA Grant Number: R825408
Title: Bioavailability & Risk Assessment of Complex Mixtures
Investigators: William Reeves, Kirby C. Donnelly, Stephen H. Safe, R. L. Autenrieth, T. J. McDonald
Institution: Texas A & M University
EPA Project Officer: Bill Stelz
Project Period: November 15, 1996 through November 14, 1999
Project Amount: $443,997
Research Category: Environmental Fate and Treatment of Toxics and Hazardous Wastes

Description:

There is an urgent need to develop an accurate method to assess the risk associated with contaminated soils and complex mixtures. Perhaps more importantly, this method should provide a means of defining acceptable residue levels to allow a more cost-effective approach to site remediation. Contaminated media at Superfund sites typically consist of complex mixtures of organic and inorganic chemicals. Especially difficult to characterize are the complex mixtures of polycyclic aromatic hydrocarbons (PAHs) and halogenated aromatic hydrocarbons (HAHs) which are often found at wood preserving, coal gasification, and refinery sites. This research program proposes to develop a methodology for estimating bioavailability, to utilize this procedure to assess the risk of complex mixtures, and to validate the method using treated and untreated residues from a variety of Superfund sites. A protocol for obtaining a water soluble fraction (WSF) will be evaluated using water (pH7 and pH9), a simulated gastric fluid (pH2), and a solution of methanol:water (1:1). The WSF protocol will be evaluated using an aged soil contaminated with two complex mixtures (a coal tar and a wood preserving waste). Spiked and unspiked soils will be prepared and extracted using the various solutions at several time points during the research. These mixtures will also be used to validate the Toxic Equivalency Factor (TEF) approach to risk assessment.

Approach:

Complex mixture risk assessment will be developed using a "top-down" and "bottom-up" approach for integration. Each mixture will first be tested in its original state, and then extracted with hexane:acetone (producing a crude extract). The crude extract will then be separated into PAH and HAH fractions. The PAH fraction will be separated into 2-, 3-, 4, 5 and >5-ring fractions, while the HAHs will be separated into chlorophenol and chlorinated dibenzo-p-dioxin and dibenzofuran fractions. Each fraction will be analyzed using bioassays to measure genotoxicity and enzyme induction. For the top-down analysis, biological tests (to define genotoxicity and potential immunotoxicity) will be used to characterize the crude extract and all subsequent fractions. For the bottom-up analysis, selected fractions will be subjected to a GC/MS analysis to identify major constituents, and individual compounds as well as reconstituted mixtures tested in the biological tests. Testing the crude extract and various fractions will delineate interactions of the components. Testing the individual and reconstituted mixtures will be used to validate a TEF approach for risk assessment and to aid in the identification of the more toxic components of the complex mixtures. In the final two years of the study, the WSF procedure will be calibrated using soil:waste mixtures collected from a minimum of four Superfund sites prior to and after remediation. The data from these analyses will be used to prepare a human health risk assessment for each site.

Expected Results:

The final product of the research will be a better methodology for assessing the risk of complex mixtures in contaminated soils and other solid matrices in the vadose zone.

Progress and Final Reports:

1997 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/678/report/1997

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/678/report/1998

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/678/report/1999

Type: STAR GRANT
Status: Completed
Reports: 1997, 1998, 1999, 2000, Final

Development of Chemical Methods to Assess the Bioavailability of Arsenic in Contaminated Media

EPA Grant Number: R825410
Title: Development of Chemical Methods to Assess the Bioavailability of Arsenic in Contaminated Media
Investigators: Nicholas T. Basta, Robin R. Rodriguez, Stan W. Casteel
Institution: Oklahoma State University - Main Campus , University of Missouri - Columbia
EPA Project Officer: Bill Stelz
Project Period: November 1, 1996 through October 31, 1999
Project Amount: $431,677
Research Category: Environmental Fate and Treatment of Toxics and Hazardous Wastes

Description:

Soil ingestion from incidental hand-to-mouth activity by children is an important issue in assessing public health risks associated with exposure to As-contaminated soils and media. Risk from enteric bioavailability of As is difficult to assess because As exists in many geochemical forms (e.g., oxides, sulfides) and physical forms (flue dust, slag, tailings, waste ore) at hazardous waste sites contaminated by mining or smelting of ore. The purpose of the proposed research is to determine the ability of chemical methods (chemical speciation, *in-vitro* gastrointestinal) to provide a reasonable estimate of As bioavailability in contaminated media and provide rapid and inexpensive information to characterize risk at Superfund sites.

Approach:

In this study, As measured by chemical methods (chemical speciation and *in-vitro* gastrointestinal methods) will be compared with As uptake by immature pigs for contaminated media (soil and slag) collected from a mining, milling, and smelter site.

Expected Results:

Benefits expected from the proposed research include inexpensive methodologies to obtain site-specific bioavailability thereby lowering the degree of uncertainty in risk assessment. Rapid, inexpensive testing methods will provide scientifically derived data to select appropriate remedies at these sites which are cost-effective and protective of human health and the environment. An accurate site-specific bioavailability method may be a useful tool to evaluate the effectiveness of remediation technologies and determine remediation endpoints.

Progress and Final Reports:

1997 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/676/report/1997

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/676/report/1998

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/676/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/676/report/2000

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/676/report/F

Type: STAR GRANT
Status: Completed
Reports: 1999, Final

Phytoremediation and Modeling of Land Contaminated by Hydrons

EPA Grant Number: R825414
Title: Phytoremediation and Modeling of Land Contaminated by Hydrons
Investigators: Clyde Munster, Malcolm Drew, Yavuz Corapcioglu
Institution: Texas A & M University
EPA Project Officer: Mitch Lasat
Project Period: October 28, 1996 through October 27, 1999
Project Amount: $452,020
Research Category: Bioremediation

Description:

There are two primary objectives of the proposed research: (1) to evaluate the effectiveness of Johnsongrass (*Sorghum halapense*) and Canada wild-rye grass (*Elymus canadensis*) in the phytoremediation of soil contaminated with a mixture of recalcitrant PCB (2, 2'-dichlorobiphenyl), PAH (dibenzo(a,h)anthracene) and TNT (trinitrotoluene) using field and greenhouse experiments and, (2) to use the field and greenhouse data to calibrate and validate a recently developed bioremediation model that is capable of simulating the removal and degradation of organic chemicals from the soil by plant roots and their rhizosphere.

Approach:

A multidisciplinary team of researchers will utilize field investigations, green house studies and computer modeling to study the effectiveness of warm and cool season grasses in the phytoremediation of a PCB, a PAH and TNT. The field study will be conducted in a controlled, lysimeter environment where a mass balance of the water entering and leaving the soil can be maintained. All leachate moving through the soil as well as all the soil and vegetation will be collected and analyzed for chemical concentrations. The greenhouse study will be used to supplement the field study with leachate, soil and vegetation analysis. In addition, the greenhouse study will permit greater rooting depth and destructive sampling for root growth characteristics throughout the growing season. The new computer model will be rigorously tested against the field and greenhouse data. If necessary, model modifications will be made to more closely simulate the processes observed in the field and greenhouse research. The tested model will be able to evaluate the effectiveness of phytoremediation on soil contaminated by recalcitrant hydrocarbons. The field and green house research will assess the contribution of vegetation to the apparent disappearance from the soil of representative recalcitrant PCBs, PAHs and TNT. Data from three growing seasons will document the partitioning of 2, 2'-dichlorobiphenyl, dibenzo(a,h)anthracene and trinitrotoluene in the soil, vegetation and leachate, as well as their degradation.

Expected Results:

The comprehensive field and greenhouse data set will be used to validate and calibrate a newly developed phytoremediation model. This quantitative model is capable of simulating the movement of organic compounds through the soil and water as well as the uptake of chemicals by vegetation roots. This model will be used as a predictive tool to assess the effectiveness of phytoremediation on soil contaminated by recalcitrant hydrocarbons.

Relevant Websites:

http://www.agen.tamu.edu/pet/tools/stn-tool.html/

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/593/report/1999

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/593/report/F

Type: STAR GRANT
Status: Completed
Reports: 1998, Final

Intrinsic Stable Isotopic Tracers of Environmental Contaminants

EPA Grant Number: R825420
Title: Intrinsic Stable Isotopic Tracers of Environmental Contaminants
Investigators: Stephen A. Macko, Mahlon C. Kennicutt
Institution: University of Virginia - Main Campus , Texas A & M University
EPA Project Officer: S. Bala Krishnan
Project Period: October 1, 1996 through September 30, 1999
Project Amount: $358,949
Research Category: Water Engineering

Description:

The stable isotopic composition of a contaminant in the environment is the end-result of a complex chain of events. Chemicals produced from disparate sources by fundamentally different processes would be expected to exhibit intrinsic isotopic compositions that could be used to identify sources. Compound specific isotope analysis (CSIA) based on gas chromatography /isotope ratio mass spectrometry (GC/IRMS) will be used to uniquely identify naturally occurring pollutants, such as PAH in petroleum, and synthetic or manufactured pollutants, such as pesticides and PCBs. The expected benefit to be derived from the application of CSIA to environmental questions is to be able to more accurately define the sources, fate, and transformation of pollutant mixtures in the environment. Effective environmental regulation can only be accomplished if contaminant distributions can be unambiguously linked to known processes or sources. As concerns about the quality of the environment have increased it has become clear that our ability to inventory, trace and provide a mass balance of pollutants in the environment is poor.

Approach:

The study proposed here will include development of purification techniques, optimization of instrumental conditions, development of models based on study results, and field testing of the concepts developed. Selected polycyclic aromatic hydrocarbons, pesticides, and PCBs will be the analytes of interest. Fused silica capillary columns will be used to provide resolution of complex mixtures, minimize co-elution and background interferences, and limit column bleed during GC/IRMS analysis. The resolution and accuracy of the method will be determined by analyzing authentic standards, primary sources of contaminants, extracts of effluents and well characterized pollutant occurrences.

The proposed study has four primary objectives: (1) development of isolation techniques that produce high purity, unaltered concentrates that maintain the stable isotopic integrity of the analytes; (2) determine the stable isotopic composition of target analytes in primary sources of contaminants; (3) determine the stable isotopic composition of priority pollutants in selected processes that introduce contaminants to the environment; and (4) verify the techniques and models developed with well-characterized pollutant occurrence using selected samples from EPA's Casco Bay National Estuarine Program, EPA's Galveston Bay National Estuarine Program, EPA's Environmental Monitoring and Assessment Program-Near Coastal, and NOAA's Status and Trends Program.

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/539/report/1998

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/539/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1999, 2000

Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River

EPA Grant Number: R825791
Title: Ecological Risks, Stakeholder Values and River Basins: Testing Management Alternatives for the Illinois River
Investigators: Mark Meo, Keith D. Willett, James Sipes, Will Focht, Lowell Caneday, Edward T. Sankowski, Baxter Vieux, R. A. Lynch
Institution: University of Oklahoma , Oklahoma State University - Main Campus
EPA Project Officer: Gina Perovich
Project Period: June 1, 1998 through May 31, 2001
Project Amount: $849,996
Research Category: Water and Watersheds

Description:

The Illinois River, one of the most scenic and pristine rivers in Oklahoma, has been the center of political controversy about private property rights and environmental protection for over twenty-five years. The Illinois has provided multiple social benefits to the citizens of Oklahoma through its use for recreation, water and power supply, flood control, and nutrient removal. Yet, the inability of different interests in both states to reach agreement about how to protect the future of the illinois watershed has placed its hydrologic resources at increased risk of long-term degradation. With the absence of a unique environmental issue or feature to catalyze political support for policy change, the illinois Basin, which is characterized by continuing land use conflicts within a decentralized institutional setting, exemplifies long-term river basin management challenges in general.

This three-year interdisciplinary research project addresses the theoretical issue of how different environmental and social values held by river basin stakeholders can be identified and compared so that more effective environmental protection strategies can be determined and adopted by local land use interests and state agencies. The investigators propose to develop and test alternative management strategies for the illinois River watershed by linking together the ecological, economic, hydrological, social, and political aspects of the watershed in an interdisciplinary approach that provides a more realistic framework for calculating, communicating, and negotiating environmental risks and competing social values.

Approach:

In the first two years of the project the research team will: (1) Determine the effects of alternative land and water uses for three study sites in the river basin; (2) Calculate the ecological risks associated with different intensities of resource use; (3) Develop distributed hydrologic models using GIS that incorporate water quality and quantity aspects of alternative land use practices; and (4) Develop a computer simulation of each of the three sites that will enable stakeholders to visualize more easily the implications of different management options for the river basin's resources. At the same time, members of the research team will be investigating stakeholders' perspectives of natural, economic, and sociopolitical impacts through interviews and focus group sessions. These groups will include technical experts, lay stakeholders, and policy makers. Background data will be drawn from the investigators' prior studies of the illinois watershed, its carrying capacity, and comprehensive land use plans.
In the third year of the project, stakeholder groups will be engaged in a policy dialogue and a test of the effectiveness of integrated computer models to facilitate the risk communication of complex environmental management issues. Visual simulations developed from GIS-based distributed hydrological models will be shown to stakeholders in conjunction with focus group sessions to ascertain management preferences and the overall legitimacy of negotiated agreements. Negotiation workshops will be held to develop a consensus about land use practices that afford an adequate level of protection to the basin.

Expected Results:

The entire process will be tested to ascertain the degree to which the process is viewed by experts and lay stakeholders as efficient, effective, and legitimate, and therefore acceptable. For broader application of the approach, the research will be formatted on a CD for dissemination. The results of the research also will be published in the refereed literature and used to advance integrated watershed planning and management.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/843/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/843/report/2000

Type: STAR GRANT
Status: Completed
Reports: 1998, Final

Improved Risk Assessment with an Intragenic Mutation Assay

EPA Grant Number: R825810
Title: Improved Risk Assessment with an Intragenic Mutation Assay
Investigators: Vincent L. Wilson, William R. Lee
Institution: Louisiana State University - Baton Rouge
EPA Project Officer: Chris Saint
Project Period: October 1, 1997 through September 30, 2000
Project Amount: $428,305
Research Category: Issues in Human Health Risk Assessment

Description:

The ability to detect intragenic mutations at sensitivities of better than one mutant allele in 106 or more cells provides the unique opportunity to directly evaluate the genotoxic activities of hazardous agents in model systems and ultimately in exposed human populations. Such a sensitive molecular test would enable more accurate assessment of the toxic potential of chemicals at very low doses and multiple exposures, similar to those commonly found in the human living and work environments. Some complex mixtures may also be decipherable by the determination of intragenic base substitution mutation spectra analysis, since mutation spectra are well known to be genotoxic agent specific if analyzed at the DNA nucleotide sequence level.

This laboratory has established methods for the detection of single base substitution mutations at a sensitivity of one mutant in the presence of 106, 107, or more wild type cells. These methods are based on the combined sensitivity and specificity of the polymerase chain reaction (PCR), restriction endonuclease digestion (RE), and the ligase chain reaction (LCR) which enables the detection of these rare mutant cell(s) in minute tissue specimens. The sensitivity of this PCR/RE/LCR test can be adjusted to range from one mutant cell in 102 to 107 normal cells by varying the number of genomes in the sample. These PCR/RE/LCR molecular techniques, will be used to establish a universal intragenic molecular test for the in vivo induction of germline (or somatic) mutations by environmentally important genotoxic agents.

It is hypothesized that this molecular test for intragenic mutations will enable more accurate determinations of the genotoxic potential of very low dose exposures of hazardous agents in model systems, of multiple and complex exposure patterns, and the identification of the genetic effects of individual components of at least simple mixtures. This hypothesis will be experimentally approached with the use of two well characterized animal model systems: Drosophila melanogaster and Mus musculus. The quantitative identification of intragenic mutations in the germline of D. melanogaster and mice offers the unique opportunity to validate these methods with published data from the well established standard genetic mutation tests. Since PCR/RE/LCR procedures are dependent only on the knowledge of the DNA sequence of the gene under study, the present molecular test for the induction and frequency of base substitution mutations will ultimately be universally applicable to any species.

These studies will use a well tested standard reference mutagen, ethyl nitrosourea (ENU), and the environmentally important methyl bromide (MeBr). The genotoxic effects of single and multiple (5 daily doses per week for two weeks) dosing regimens will be determined in the germ cell populations of the D. melanogaster and mouse testis. The genes under study include the well characterized alcohol dehydrogenase (Adh) gene locus in D. melanogaster and the Harvey-ras and p53 genes in mice. Similarly, mixtures of these two agents and a mixture of 2-chloro-ethyl methanesulfonate and ENU will be subjected to the same singleEand multiple dose genotoxic analyses in mice. In addition, site specific mutagen frequency studies will be performed in the Adh gene of D. melanogaster and in the p53 gene of the mouse model.

The PCR/RE/LCR molecular test will complement the standard heritable mutation assays and will enable germ cell genotoxic testing to be performed relatively cheaply and routinely in the mammalian model and perhaps ultimately in the accidentally exposed human.

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5123/report/1998

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5123/report/F

Type: STAR GRANT
Status: Completed
Reports: 1998, 2000, Final

Age and Interactive Toxicity of Organophosphorus Insecticides

EPA Grant Number: R825811
Title: Age and Interactive Toxicity of Organophosphorus Insecticides
Investigators: Carey Pope
Institution: Oklahoma State University
EPA Project Officer: Chris Saint
Project Period: January 1, 1998 through December 31, 2000
Research Category: Issues in Human Health Risk Assessment

Description:

This research program compares age-related sensitivity to the organophosphorus insecticides (OPs) chlorpyrifos (CPF), parathion (PS) and methyl parathion (MPS). The contributions of presynaptic neurochemical processes, i.e., regulation of acetylcholine (ACh) synthesis and release, in the differential expression of anticholinesterase toxicity were examined. We hypothesized that limited activity or adaptability of presynaptic regulatory processes in young animals would be correlated with higher acute sensitivity to OPs. We further hypothesized that selective changes in ACh synthesis and/or release by some OPs through additional, direct presynaptic receptor interactions could modulate anticholinesterase toxicity and influence age-related differences in OP sensitivity. Such selective actions of some OP agents could also influence the toxicity resulting from combined OP exposures. Interactive effects of co-exposure to selected OPs in neonatal and adult rats were evaluated. The information from these studies suggests an important role for presynaptic modulation of cholinergic neurotransmission in the ultimate expression of toxicity following acetylcholinesterase inhibition and highlights mechanisms of interactive toxicity of anticholinesterases.

Summary/Accomplishments:

Estimates of acute sensitivity to all three pesticides in the three age groups used LD10 as the indicator. Adults were less sensitive than neonates and juveniles to all three agents: neonatal rats were 7-9 times more sensitive whereas juveniles were 2-5 times more sensitive to lethality from all three pesticides. High affinity choline uptake, the rate limiting step in acetylcholine synthesis, is reduced in an age- and brain regional-dependent manner following CPF exposure, i.e., uptake was inhibited earliest in neonatal, later in juvenile and latest in adult brain. In vitro studies suggest that the active metabolites of PS, MPS and CPF (i.e., paraoxon, methyl paraoxon and

CPF oxon) have qualitatively different direct effects on muscarinic autoreceptors in adult brain, with paraoxon and methyl paraoxon acting as agonists and CPF oxon acting as an antagonist. These differential effects at the muscarinic autoreceptor may contribute to differential toxicity with these OP pesticides. Muscarinic autoreceptors develop postnatally in an age- and brain regional-dependent manner. In vivo, muscarinic autoreceptor function was reduced by CPF in both juvenile and adult rats, but with a different timecourse (again, earlier in younger animals compared to adults). Autoreceptor function was also impaired by MPS but in a relatively similar manner following LD10 exposures in juvenile and adult rats. The inherent activity and adaptability of muscarinic autoreceptor function in different age groups may contribute to age-related differences in acute sensitivity to OP anticholinsterases. Toxicity from combined exposures to PS and CPF in adult rats was markedly influenced by the sequence of administration. In contrast to our hypothesis that CPF has an additional action(s) that lessens cholinergic toxicity, animals pretreated with CPF and then exposed to PS exhibited more extensive cholinergic toxicity than animals pretreated with PS and then challenged with CPF. Similar effects of sequential dosing were noted with interactive CPF and MPS exposures (i.e., adult rats pre-exposed to CPF exhibited markedly greater toxicity than rats given the same dosages but with the sequence of exposure reversed). In contrast, little evidence for sequence-dependent differences in toxicity was noted in neonatal rats exposed to interactive CPF and PS exposures. These studies illustrate the complexity of interactions occuring with combined exposures to organophosphorus toxicants having a common mechanism of toxicity.

Relevant Websites:
http://www.cvm.okstate.edu/research/facilities/toxicologylab/

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5126/report/1998

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5126/report/2000

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5126/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: 2000, 2001

School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure

EPA Grant Number: R825813
Title: School-Based Study of Complex Environmental Exposures and Related Health Effects in Children Part A - Exposure
Investigators: Ken Sexton, Ian Greaves, Gurumurthy Ramachandran, John L. Adgate, Timothy Church
Institution: University of Minnesota
EPA Project Officer: Chris Saint
Project Period: March 1, 1998 through March 1, 2001
Project Amount: $899,264
Research Category: Issues in Human Health Risk Assessment

Description:

The objectives of this study are to (1) document complex exposure patterns involving multiple acute exposures and exposures to chemical mixtures for school children (K - 5) from two low-income, racially diverse neighborhoods in Minneapolis, (2) examine temporal variability by monitoring complex exposures three times over a twelve-month period, (3) apportion the relative contribution to measured personal exposure of outdoor community air, air inside the child's school, and air inside the child's residence, (4) evaluate the relationship between measured exposures and internal dose using biological markers of exposure in blood and urine, and (5) compare children's exposures between a new school designed to enhance indoor air quality and an older school with more traditional architecture, mechanical systems, and furnishings.

Approach:

This study will measure children's exposures to volatile organic chemicals, metals, environmental tobacco smoke, PAHs, and pesticides using a combination of measurement methods, including outdoor, in-home, in-school, personal, and human tissue monitoring. The target population is 800 children attending elementary school in two low-income neighborhoods in south Minneapolis (5% Native American, 15% Asian Americans, 65% African American, 15% white).

Expected Results:

The results from this study will provide critical scientific facts about complex, multipathway exposures for poor, inner-urban children; a key factor in making more informed and reasonable decisions about comparative and cumulative risks. Findings will furnish important scientific building blocks necessary to shift risk assessments toward a more broad-based approach and away from a narrow focus on single chemicals and exposure pathways. Ultimately, realsitic health risk assessments for this vulnerable segment of the population depend on obtaining accurate and precise measuremnts of actual exposures to environmental toxicants.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/463/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/463/report/2001

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1998, 1999, 2000, 2001

Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans

EPA Grant Number: R825817
Title: Reproductive Health, Serum Dixon, and P450 Genes in Vietnam Veterans
Investigators: Anne Sweeney, Sharon Cooper, Michael Denison, Elaine Symanski, Xifeng Wu, Chuan-Chuan Wun
Institution: University of Texas at Houston
EPA Project Officer: Kacee Deener
Project Period: November 19, 1997 through November 18, 2000
Project Amount: $874,195
Research Category: Issues in Human Health Risk Assessment

Description:

In the 1996 update by the Institute of Medicine's Committee to Review the Health Effects in Vietnam Veterans of Exposure to Herbicides, it was concluded that there was "limited/suggestive evidence" of an association between paternal herbicide exposure and spina bifida in the offspring of male Vietnam veterans. Much of the concern is with regard to the dioxin contamination present in herbicides used during the Vietnam War. Dioxin exposure, however, is not limited to Vietnam veterans and a "safe threshold" for dioxin exposure has never been established for the U.S. general population. The contradictory findings of previous research relating dioxin and adverse reproductive effects may be due in part to the absence of a genetic susceptibility component to identify high-risk subpopulations. The proposed case-control study is designed to test the hypothesis that the interaction between parental P450 genotype and dioxin exposure increases the risk of neural tube defects (NTDs), using Vietnam era veterans as the study population.

Approach:

A listing of all NTDs diagnosed in the U.S. between 1965-1990 will be obtained from birth certificates, fetal death certificates and death certificates (for older offspring). This interval represents the majority of childbearing years for Vietnam era veterans. Vietnam era and theater service will be ascertained through linkage with Department of Defense and Department of Veterans Affairs databases. Cases (a veteran parent of an offspring with an NTD born between 01/01/65-01/01/90) and controls (a veteran parent of a liveborn infant free of NTDs) will be selected from pregnancies in which either parent was a Vietnam era veteran. An Exposure Index that has been developed based on military occupational specialty, the years served in Vietnam, and service in Vietnam for women veterans will classify all subjects. Individuals will be selected from the high, medium, and low exposure probability strata for the in-depth case-control evaluation phase. Current addresses for selected participants will be obtained through an existing interagency agreement with NIOSH, the IRS, the SSA, and the Department of Veterans Affairs. Participants will be asked to complete a mailed questionnaire detailing demographic and lifestyle characteristics, and medical, reproductive, occupational, and military histories. A blood sample will be collected at the VA Medical Center or outpatient clinic located nearest to the participant's home. All the samples will be subjected to a bioassay for detection of total dioxin-like activity. A subset of the samples, including all with readily detectable dioxin-like activity as well as a random sample of the remaining serum specimens, will undergo a quantitative dioxin analysis. In addition, all samples will be analyzed for CYP1A1 genotyping. One method will reveal Msp1 polymorphisms; the second detects an A/G substitution on exon 7 of the CYP1A1 gene, the genetic basis of an isoleucine/valine substitution. Data analysis will include crude and adjusted odds ratios for NTDs and high versus low dioxin levels as determined by the bioassay. Odds ratios for NTDs and each type of P450 allele will be calculated to test the hypothesis that among NTD-affected pregnancies, there will be a higher proportion of subjects with the variant allele compared with pregnancies in the control group. Finally, a multivariate analysis will be conducted to test for the interaction between P450 genotype and serum dioxin level and association with NTDs.

Expected Results:

This study will provide the first assessment of dioxin exposure among female Vietnam veterans and permit the evaluation of a maternally mediated effect. The study will also include Vietnam veterans who served in the earlier years of the conflict (1962-1966); an important group underrepresented in previous studies of Agent Orange exposure and health effects. Finally, this represents the first attempt to examine an underlying genetic susceptibility component to dioxin toxicity resulting in an adverse reproductive event.

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/61/report/1998

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/61/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/61/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/61/report/2001

Type: STAR GRANT
Status: Completed
Reports: 1998, Final

Improving Air Quality Benefit Estimates from Hedonic Models

EPA Grant Number: R825826
Title: Improving Air Quality Benefit Estimates from Hedonic Models
Investigators: Mark Thayer, James C. Murdoch, Kurt Beron
Institution: San Diego State University, The University of Texas at Dallas
EPA Project Officer: Matthew Clark
Project Period: October 1, 1997 through September 30, 1998
Project Amount: $124,931
Research Category: Decision Making and Valuation for Environmental Policy

Description:

The objective of the research proposed herein is to critically examine the relative importance of data aggregation, attribute tradeoffs, and variation caused by space and time within a hedonic benefit study using a single, pooled cross-section, time-series data set. The primary focus will be on the hedonic price of air quality. The analysis will be conducted in the South Coast Air Basin, which consists of the California counties Los Angeles, Orange, Riverside, and San Bernadino for the period 1980-1996. These counties contain over one hundred cities, which will generate sufficient spatial variation to test the relative importance of community characteristics on hedonic price estimation. The extensive time series nature of the data will allow the required temporal variation.

Approach:

We will use a hierarchical linear model (sometimes called a mixed model or a multilevel model) for our analysis of the relationship between air quality and housing prices. Our empirical analysis will employ the two techniques that are generally favored in the theoretical literature, full maximum likelihood and restricted maximum likelihood.

Expected Results:

The important outputs of our research will be: (1) an extensive pooled cross-section, time-series data set that will include approximately 50,000 observations per year over the study period, 1980-96; (2) the application of a new procedure to the task of estimating hedonic price functions; and (3) estimated marginal willingness to pay values that will be more suitable for benefits transfer. A set of case studies will become the benchmark for future benefits transfer work.

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/731/report/1998

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/731/report/F

Type: STAR GRANT
Status: Completed
Reports: 1999, 2000, Final

Microbial indicators of biological integrity and nutrient stress for aquatic ecosystems

EPA Grant Number: R825868
Title: Microbial indicators of biological integrity and nutrient stress for aquatic ecosystems
Investigators: James P. Grover, Thomas H. Chrzanowski
Institution: University of Texas at Arlington
EPA Project Officer: Barbara Levinson
Project Period: September 1, 1997 through August 31, 2000
Project Amount: $748,000
Research Category: Ecosystem Indicators

Description:

Changes in nutrient (N and P) inputs to aquatic ecosystems dramatically alter community composition and consequently ecosystem function. Alterations of community structure usually begin at the microbial level as it is here that organisms have mechanisms for extracting from the external milieu elements that are required to synthesize new biomass. Clearly, all organisms have requirements for nutrients that must be met if they are to persist and organisms differ in their competitive ability to sequester these nutrients. Thus it follows logically that when environments differ in nutrient conditions, there will be differences in community composition.

Objectives/Hypotheses:

We propose to examine several chemical and biological variables that may provide not only a broadly applicable approach to understanding the biological consequences of nutrient loading in aquatic systems, but may also provide a means of predicting the resulting community structure. We base our approach on recent advances in aquatic microbial ecology and on theory developed in the rapidly expanding field of ecological stoichiometry. The indicators we will examine are (1) seston C:N:P ratio; (2) species-level responses of algae to nutrient bioassays; (3) community-level responses of bacteria to nutrient bioassays; (4) community structure of algae; (5) community structure of bacteria; and (6) the estimated ratio of algal to bacterial specific growth rates. Our general hypothesis is that these indicators will reflect nutrient-related stresses, including eutrophication and alterations of nutrient loading ratios.

Approach:

We will employ a standard protocol for sampling events, consisting of sampling standard limnological and water quality parameters, seston stoichiometric analysis, and algal and bacterial dilution bioassays to identify limiting nutrients and estimate in situ growth rate and degree of nutrient limitation. Over 3 years, this protocol will be applied in two warm temperate reservoirs in Texas where previous work suggests differing patterns of nutrient limitation, and in two cool temperate lakes, one of which is pristine, and one which is experimentally eutrophied.

Expected Results:

We hope to demonstrate that the proposed indicators sensitively reveal seasonal shifts in nutrient limitation, interannual, inter-lake, and regional differences in nutrient stress and loading, and the effects of experimental eutrophication. The microbial indicators we propose should have wide applicability in nearly all aquatic habitats, and are based on ecosystem components with very rapid responses to environmental changes. These indicators are short-term, and thus feasible to repeat at larger temporal and spatial scales. Our study will reveal whether these short-term indicators adequately reflect whole-lake and larger-scale responses to nutrient stresses

Relevant Websites:

http://www.uta.edu/chrzanowski
http://www.uta.edu/grover

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/36/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/36/report/2000

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/36/report/F

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Type: STAR GRANT
Status: Project Period Concluded
Reports: 1998, 1999, 2000

Development of Biomarkers for haloacetonitriles-induced cell injury in Peripheral Blood

EPA Grant Number: R825955
Title: Development of Biomarkers for haloacetonitriles-induced cell injury in Peripheral Blood
Investigators: Ahmed Elsayed Ahmed
Institution: University of Texas Medical Branch - Galveston
EPA Project Officer: Cynthia Nolt-Helms
Project Period: October 1, 1997 through September 30, 2000
Project Amount: $485,147
Research Category: Drinking Water - Disinfection Byproducts

Description:

Drinking waters are contaminated with a mixture of Halogenated hydrocarbons that are disinfection byproducts. Among those are a number of toxic and carcinogenic. Halogenated acetonitriles that are known to stimulate a variety of acute and chronic adverse effects in man and in laboratory animals. The goal is to develop unique biomarkers, in a readily accessible compartment such as blood, for HAN exposure and HAN-induced cell injury. This injury may result from HAN-induced alkylative or oxidative damage to cellular macromolecules such as hemoglobin and DNA. We also plan to evaluate some of the responses to HAN in human peripheral blood cells in vitro and develop an animal model of dermal and inhalation exposure to HAN using female rats and mice.

Approach:

Methods will be developed for quantification of alkylative (cyanomethylated) and oxidative damage to cellular macromolecules (hemoglobin and DNA) using a highly sensitive and specific techniques such as HPLC with electrochemical detection and Gas chromatography/Mass spectroscopic detection of alkylated molecules. These techniques will be applicable for assessing exposure to a wide variety of small environmental pollutants and will be a sensitive method for exposure assessment of in vivo alkylative and oxidative damage. Thus, we aim to address both methodology development for biomarkers of exposure and correlation of biomarkers in peripheral blood cells (erythrocytes and lymphocytes) with HAN-induced pathological signs.

Expected Results:

Expected Results will identify target tissues of toxicity, cellular injury and macromolecular damage, that will be used to identify and qunatitate biomarkers of the adverse effects of HAN. Data obtained will define how HAN reacts with peripheral blood cellular macromolecules. This will provide basis for the development of regulatory guidelines and policies governing the tolerance levels for chronic HAN exposure in man.

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/195/report/1998

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/195/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/195/report/2000

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1999, 2001

Reproductive and endocrine effects of o,p'-DDT, an environmental estrogen, and p,p'-DDE, an antiandrogen in male and female Atlantic croaker during critical periods of their reproductive life history cycles

EPA Grant Number: R826125
Title: Reproductive and endocrine effects of o,p'-DDT, an environmental estrogen, and p,p'-DDE, an antiandrogen in male and female Atlantic croaker during critical periods of their reproductive life history cycles
Investigators: Peter Thomas
Institution: University of Texas at Austin
EPA Project Officer: David H. Reese
Project Period: October 1, 1997 through September 30, 2000
Project Amount: $430,010
Research Category: Endocrine Disruptors

Description:

The overall aim of the proposed research is to understand the nature, extent and mechanisms of reproductive and endocrine toxicity of a representative xenobiotic estrogen, o,p'-DDT, and a putative xenobiotic antiandrogen, p,p'-DDE, in an established vertebrate model, the teleost Atlantic croaker. The following specific hypotheses will be tested: (1) Embryological development, gonadal differentiation, puberty and gonadal growth are sensitive stages of the teleost reproductive life history cycle to disruption by estrogenic and antiandrogenic chemicals; (2) The reproductive toxicities of o,p'-DDT and p,p'-DDE in both male and female croaker are primarily due to their estrogenic and antiandrogenic activities, respectively; (3) Endocrine disruption in males by xenoestrogens is mediated by their binding to the testicular estrogen receptor (ER) and disruption by antiandrogens in females is caused by binding to the ovarian androgen receptor (AR) in addition to the more traditional sites of estrogen and androgen action on the hypothalamus-pituitary-gonadal-liver axis; (4) Males in general are more sensitive than females to the reproductive effects of estrogenic chemicals.

Approach:

The effects of in vivo administration o,p'-DDT will be compared to those of a synthetic estrogen, diethylstilbestrol and the effects of o,p'-DDE will be compared to those of an antiandrogen, cyproterone acetate (hypothesis 2). The effects of both DDT analogs will be compared to those of p,p'-DDD which does not bind to either the ER or AR in croaker (hypothesis 2) and a DDT mixture which approximates the analog composition in fish samples collected from the Southern California Bight. Both male and females will be exposed to the model compounds throughout their life cycles to obtain a comprehensive understanding of how chemicals impair teleost reproduction (hypothesis 1) and which reproductive life cycle stage is the most sensitive (hypothesis 4). Indices of reproductive function such as gametogenesis, sex differentiation, hatching success and sperm motility, as well as indices of endocrine function such as steroid and gonadotropin secretion and receptor concentrations will be measured after exposure to the model compounds. The sites of estrogen action will be determined by in situ hybridization of the ER mRNA and androgen action by AR assays (hypothesis 3). Estrogenic and antiandrogenic actions of the model compounds will be assessed by specific assays (hypothesis 2). Interactions of the model compounds with the ER and AR and will be examined in competition studies (hypothesis 2 and 3).

Expected Results:

It is expected that the results will support the 5 hypotheses outlined above. We expect to demonstrate for the first time the involvement of an ER in fish testes in mediating the adverse effects of xenobiotic estrogens on testicular function and the involvement of the AR in mediating the toxic actions of antiandrogens on ovarian function in vertebrates. These studies are expected to provide mechanistic explanations of how xenoestrogens and xenobiotic androgens can interfere with gonadal sex differentiation and reproductive development and induce feminization in fish and wildlife. The mechanisms of toxicity are expected to be similar to those reported in mammals and therefore can be extrapolated to other vertebrate groups. Our findings will be valuable for conducting risk assessments by state and federal agencies, especially for DDT contamination in fish populations in the Southern California Bight.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/164/report/1999

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/164/report/2001

Type: STAR GRANT
Status: Completed
Reports: 1998, 1999, 2001, Final

The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation

EPA Grant Number: R826161
Title: The Effect of In Situ Biosurfactant Production on Hydrocarbon Biodegradation
Investigators: Keith A. Strevett, R. Tanner, David A. Sabatini, J. Everett
Institution: University of Oklahoma
EPA Project Officer: S. Bala Krishnan
Project Period: March 10, 1998 through March 9, 2001
Project Amount: $323,072
Research Category: Environmental Engineering

Description:

The goal of this research is the development of a mechanistic and innovative methodology that can effectively predict and describe anaerobic and aerobic biodegradability of hydrocarbons as impacted by biosurfactants.

Approach:

The proposed study derives from the fundamental hypothesis that bioavailability of hydrocarbons in mixed chemical matrices can be described based on the individual interactions occurring in the environment. These interactions may include soil-chemical, soil-microorganism, soil-biosurfactant, microorganism-biosurfactant, etc. This research effort will, therefore, set out to quantitatively determine: the biological removal of hydrocarbons in a chemical matrix (e.g., light non-aqueous phase liquid) considering both anaerobic and aerobic metabolism in the presence of biosurfactant produced in situ; assessment of abiotic surface characteristic as altered by biosurfactants examine the decrease of interfacial tension of sorbed compounds; impact of biosurfactants on chemical transport; assessment of microbial (biotic) surface characteristic as altered by biosurfactants impact of biosurfactant on contaminant transport across cellular membrane or decrease of interfacial tension, thus increase/decrease microbial attachment to a solid matrix; impact of biosurfactants on microbial migration ability of microorganism to transport with a contaminated plume; and development of a mechanistically based model to predict the effect of in situ biosurfactant production on bioavailability based on the physicochemical characteristic of the surfactant and the surface thermodynamics of the soil and indigenous microorganisms. This prediction will use traditional interfacial forces, including Lewis acid/base, van der Waals, and electrostatic forces determined via contact angle

measurements and electrophoretic assays, as well as, traditional biokinetic models.
This research proposal outlines the implementation of batch experiments to determine intrinsic biodegradation coefficients in both anoxic and oxic conditions, biosurfactant sorption kinetics, apparent biodegradation kinetic coefficients in the presence of biosurfactant produced in situ, biosurfactant-hydrocarbon interaction, biosurfactant-soil matrix interactions, and biosurfactant-chemical matrix interactions. In addition, column experiments are used to evaluate batch experiment parameters in a flow field to promote further evaluation and scale-up of the fundamentally-based model. The experimentally determined results will be compared with theoretical predictions using independently determined surface thermodynamic and biokinetics parameters.

Expected Results:

The expected results from this research will produce an advanced methodology to describe and predict bioavailability impact on bioremediation strategies. This methodology integrates physicochemical and biogeochemical processes with biophysical chemistry to evaluate migrating groundwater contamination scenarios.

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/917/report/1998

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/917/report/1999

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/917/report/2001

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/917/report/F

Type: STAR GRANT
Status: Completed
Reports: 2000, Final

Investigation of the Elementary Reaction Mechanisms of Fly-Ash Mediated Formation of PCDD/F

EPA Grant Number: R826166
Title: Investigation of the Elementary Reaction Mechanisms of Fly-Ash Mediated Formation of PCDD/F
Investigators: Barry Dellinger
Institution: Louisiana State University - Baton Rouge
EPA Project Officer: Paul Shapiro
Project Period: October 1, 1997 through September 30, 2000
Project Amount: $202,976
Research Category: Environmental Engineering

Description:

Combustion and thermal processes are generally recognized as the major source of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F) in the environment. The US-EPA has targeted their emissions for stringent new regulation that generally involve the installation of costly new control devices that only transfer the PCDD/F to different media. The goal of this project is to prevent the formation of PCDD/F through modification of conditions in the source. Since it is now well-established that PCDD/F are formed in the post-combustion region, our strategies focus on techniques that apply to "cool-zone" chemistry.
We have developed a unified pathway of formation that incorporates most of the known observations and theories of PCDD/F formation. This pathways suggests the following hypothesized control strategies that we will test in this project:

Control through prevention of de novo formation of small-molecule, PCDD/F precursors that are formed from gas-solid reactions of combustion-generated radicals with combustion generated soot and char.

Control of chemisorption of large-molecule precursors (formed from gas-phase molecular growth involving the de novo precursors) on fly-ash surfaces.

Control of surface catalyzed chlorination by transition metal chlorides.

Approach:

We will use model fly-ashes and model soots/chars to test each step in our unified pathway and determine: 1) the rate controlling step, 2) the rate controlling reagents, and 3) the range of conditions under which each step occurs. A packed-bed flow reactor will be used to study chemisorption and chlorination of chemical probes. Surface analysis of the model fly-ashes (i.e. doped silica and alumina foams) will be performed to determine the chemical nature of their surfaces and will be used to correlate their structure with observed yields of PCDD/F. A laser photolysis/photoionization mass spectrometer system will be used to study the products of reactions of Cl, H, O, OH, and HO2 with various soots in a wall-coated reactor. The data from each type of experiment will be incorporated into a unified reaction kinetic model.

Expected Results:

The goal of this project is to manage risk from exposure to combustion-generated PCDD/F. We will develop specific methods for prevention of formation of PCDD/F that can be subjected to field evaluation. We will also develop a unified model of formation that will suggest general prevention strategies for further development. Successful implementation of these techniques will speed the reduction in PCDD/F emissions as well as reduce the cost of control.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/921/report/2000

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/921/report/F

Type: STAR GRANT
Status: Completed
Reports: 1998, 1999, Final

Innovations in Vapor Phase Bioreactor Design

EPA Grant Number: R826168
Title: Innovations in Vapor Phase Bioreactor Design
Investigators: Kerry A. Kinney
Institution: University of Texas at Austin
EPA Project Officer: Paul Shapiro
Project Period: December 1, 1997 through November 30, 2000
Project Amount: $293,809
Research Category: Environmental Engineering

Description:

The purpose of the proposed research is to develop an efficient, vapor phase bioreactor that will reliably treat VOC-contaminated air streams over long periods of time. Conventional vapor phase bioreactor systems do not adequately control several important operating parameters such as biomass distribution, biomass activity and nutrient/moisture levels within the biofilm. These simple systems work acceptably during short term tests in the laboratory but fail to ensure reliable performance in the field where process variables fluctuate widely. In this study, the following three design features will be investigated for their ability to overcome several key problems that inhibit the reliable performance of vapor phase bioreactors:

(1) Directionally-switching operation (to improve biomass distribution and prevent clogging);
(2) Slip stream feed (to maintain high biomass activities even during periods of little or no contaminant feed); and
(3) An aerosol system (to efficiently deliver nutrients and moisture to the biofilm).

Approach:

Four, laboratory-scale, vapor phase bioreactors will be constructed that incorporate each of the bioreactor design innovations described above. During the first phase of the study, the directionally-switching parameters required to control biomass accumulation and distribution will be determined. During second study phase, the effectiveness of the slip stream to maintain high biomass activity during continuous operation as well as during system shutdowns will be evaluated. The final study phase will be devoted to optimizing the aerosol nutrient and moisture delivery system. To make the study results broadly applicable, the effectiveness of each of these design modifications will be determined for a bioreactor packed with inert media as well as for a bioreactor packed with a natural, compost-based material.

Expected Results:

Vapor phase bioreactors have the potential to treat air streams contaminated with VOCs in a cost-effective and efficient manner. Unlike other air pollution control technologies, vapor phase bioreactors are relatively "clean" systems that do not consume large amounts of energy or generate undesirable byproducts. Successful optimization of the three design innovations will allow greater control of several important operating parameters and, ultimately will result in more stable and efficient bioreactor performance. Particularly for small businesses, an inexpensive, low-risk, and reliable vapor phase bioreactor will make it much easier to comply with increasingly stringent control requirements for VOC emissions.

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/776/report/1998

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/776/report/1999

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/776/report/F

Type: STAR GRANT
Status: Completed
Reports: 1998, 1999, 2000, 2001, Final

Role of Microbial Metabolism and Cometabolism in Treating Mixtures of Biodegradable and Nonbiodegradable Chemicals in Granular Activated Carbon Columns

EPA Grant Number: R826170
Title: Role of Microbial Metabolism and Cometabolism in Treating Mixtures of Biodegradable and Nonbiodegradable Chemicals in Granular Activated Carbon Columns
Investigators: Gerald E. Speitel
Institution: University of Texas at Austin
EPA Project Officer: S. Bala Krishnan
Project Period: December 1, 1997 through November 30, 2000
Project Amount: $304,688
Research Category: Environmental Engineering

Description:

Granular activated carbon (GAC) is widely used to treat water contaminated with synthetic organic chemicals (SOCs). Practically no information is available on combining adsorption and biodegradation to treat mixtures of biodegradable and nonbiodegradable SOCs, a very common problem. Biodegradation can increase the GAC service life and improve process performance relative to adsorption alone. This research seeks to 1) develop a better understanding of the effect of biodegradation on the service life of GAC columns, 2) identify conditions where metabolism of SOCs is advantageous, and 3) identify conditions where cometabolism of SOCs is advantageous.

Approach:

The objectives will be achieved by an experimental program, complemented by mathematical modeling. SOCs over a broad range of characteristics will be studied from among the chemicals of current concern. Most experiments will involve two-component mixtures of a biodegradable and nonbiodegradable SOC. Typical GAC columns consist of three zones: exhausted GAC, mass transfer, and virgin GAC zones. All three are important to the success of biodegradation/ adsorption systems in different ways. To discern the contribution of each zone, column experiments will be conducted with exhausted GAC zones only, mass transfer zones only, and complete GAC columns. Gas chromatography and radiochemical techniques with 14C-SOCs will be used to track the fate of both SOCs. Cometabolism is a technique for biodegrading SOCs that are, in a traditional sense, nonbiode-gradable. No research has been done on cometabolism in GAC columns; therefore, preliminary experiments will be run to identify appropriate growth chemicals to stimulate cometabolism, prior to column experiments. Supporting experiments will measure desorption, displacement, and irreversible adsorption, which mainly affect bioregeneration of the GAC. Also, various equilibrium and kinetic parameters will be measured to support experimental design, data analysis, and modeling. Two existing biodegradation/adsorption models will be used, a simple equilibrium model and a sophisticated kinetic model. The models will provide a framework for synthesizing the experimental results into general observations on the applicability of biodegradation/adsorption systems for the treatment of mixtures.

Expected Results:

This research will fill a significant gap in our knowledge about GAC treatment, a gap that has economic, process performance, and health ramifications. Biodegradation/ adsorption systems are potentially less costly because the GAC service life can be longer than with adsorption alone. Ignorance of the process fundamentals has stymied technological advances beyond the current practice of considering only adsorption. This work will provide the fundamental information needed to stimulate innovation in treating mixtures of biodegradable and nonbiodegradable SOCs. This research will develop the a comprehensive experimental database on the performance of biodegradation/ adsorption systems in treating mixtures of biodegradable and nonbiodegradable SOCs, and will provide guidance on when biodegradation is attractive relative to adsorption alone and to what extent the GAC service life can be increased. The first data on cometabolism in GAC columns will be developed, and further testing and verification of the two computer simulation models will be possible. With this research, sufficient data will be available to assess biodegradation/adsorption systems with confidence and to indicate under what circumstances they are competitive with other treatment processes.

Relevant Websites:
http://www.ce.utexas.edu/prof/speitel/home.html

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/920/report/1998

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/920/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/920/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/920/report/2001

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/920/report/F

Type: STAR GRANT
Status: Completed
Reports: 1999, 2000, Final

Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment

EPA Grant Number: R826178
Title: Gas chromatography-isotope ratio mass spectrometry-A novel approach for monitoring the origin and fate of hydrocarbon contaminants in the environment
Investigators: R. Paul Philp
Institution: University of Oklahoma
EPA Project Officer: S. Bala Krishnan
Project Period: October 1, 1997 through September 30, 2000
Project Amount: $313,743
Research Category: Exploratory Research - Environmental Chemistry

Description:

Correlation of hydrocarbon contaminants with suspected sources is a formidable task, particularly for weathered samples. GC and GCMS can produce ambiguous results when correlating weathered and unweathered samples. This project will investigate using gas chromatography-isotope ratio mass spectrometry(GCIRMS) to determine the isotopic composition of individual compounds for correlation purposes. Preliminary results have shown the isotopic composition of resolvable individual compounds remain virtually unaffected by weathering. Isotopic values are additive-thus if two gasoline samples commingle, a mixing model can be developed to determine the relative proportions of the two gasolines in the mixture. GCIRMS will also be investigated to monitor hydrocarbons in wildlife, and correlating them with a specific spill.

Approach:

Crude oils and hydrocarbon products will be weathered and analyzed by GC, GCMS, and GCIRMS before and after weathering, to determine changes resulting from weathering. Asphaltenes will be isolated from severely biodegraded samples, pyrolysed and isotopic compositions of the individual compounds determined as an alternative method for correlating purposes. Laboratory studies will be undertaken with individual gasolines, and mixtures of gasolines in varying proportions, to illustrate that isotopic values for the individual compounds are additive. Investigation of oxygenated additives will increase the specificity since different suppliers may use a common gasoline source but the additives may be company specific.

Wildlife samples affected by oil spills will be analysed to determine if any recovered hydrocarbons can be linked to a specific spill on the basis of the GCIRMS data.

Expected Results:

Preliminary data have indicated that GCIRMS has potential for monitoring the origin and fate of hydrocarbons in the environment. Examination of more extensively degraded samples will support this conclusion and permit development of a routine GCIRMS procedure, in conjunction with GC and GCMS. Development of mixing models based on isotopic compositions of individual compounds in gasoline samples will provide a useful tool for determining the composition of mixtures resulting from leaking storage tanks. The key to all of these experiments is based on the fact that preliminary results have shown that isotopic compositions of individual compounds do not change significantly with weathering and secondly contaminants such as gasoline that may have virtually identical GC and GCMS fingerprints can be discriminated on the basis of their isotopic compositions.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/332/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/332/report/2000

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/332/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1999, 2000

Ecotoxicity Risks Associated with the Land Treatment of Petrochemical Wastes

EPA Grant Number: R826242
Title: Ecotoxicity Risks Associated with the Land Treatment of Petrochemical Wastes
Investigators: Robert L. Lochmiller, Charles W. Qualls
Institution: Oklahoma State University
EPA Project Officer: Dale Manty
Project Period: October 1, 1997 through September 30, 2000
Project Amount: $406,229
Research Category: Exploratory Research - Environmental Biology

Description:

Although many consider Land Treatment of Petrochemical Industrial wastes to be a viable and safe management practice, recent field studies by our laboratory raises serious environmental concerns regarding immunotoxicity and fluorosis risks to wild vertebrates. We propose to examine these concerns by monitoring immunologic and pathologic responses of cotton rats (Sigmodon hispidus) in situ by seasonally collecting resident animals from replicated Land Treatment and Reference Sites throughout Oklahoma. Biomarker responses (immune system function, biotransformation enzyme activities, pathology) will be compared to soil and tissue contaminant levels to identify probable causative agents. We hypothesize that fluoride, lead, arsenic, and other contaminants are universally high in Land-Treatment soils and that these contaminants behave in a dose-response fashion to cause a high incidence of dental fluorosis and immune system dysfunction in resident small mammal populations.

Approach:

Our experimental approach will be to seasonally (winter, summer) monitor demographic changes and physiological integrity of resident rodents from 5 Land Treatment sites and 5 ecologically-matched reference sites across 2 years to assess ecotoxicity risks from immunotoxicants and fluoride in soil; a randomized block design. Populations will be surveyed to determine if survival rate, recruitment, age/sex structure, and density are adversely impacted by Land Treatment of petroleum wastes. Seasonally, adult rodents will be returned to the laboratory to assess immune system function, pathology, biotransformation enzyme activity, and tissue contaminant levels.

Expected Results:

Our studies will provide the first examination of ecotoxicity risks associated with the Land Treatment of petrochemical waste products that are generated by the oil refining industry. We anticipate that our research will identify potential problems with chronic exposure to immunotoxicants and fluoride in the soil of these sites.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/894/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/894/report/2000

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1999, 2000

Biological Markers of Exposure to Benzene

EPA Grant Number: R826249
Title: Biological Markers of Exposure to Benzene
Investigators: Rogene F. Henderson
Institution: Lovelace Respiratory Research Institute
2425 Ridgecrest Dr. SE
Albuquerque, NM 87108
EPA Project Officer: Stacey Katz, Gail Robarge
Project Period: March 20, 1998 through March 19, 2001
Project Amount: $471,696
Research Category: Ambient Air Quality

Description:

Benzene is a ubiquitous airborne toxicant; to improve human health risk assessment for benzene exposure, better assessment of human exposure to benzene is needed. Biological markers provide a direct and objective means of monitoring the total exposure of individuals to specific chemicals. Biological markers of exposure may include the presence of volatile organic compounds in the exhaled air, organic compounds or their metabolites in blood or urine, adducts formed with macromolecules such as nucleic acids or proteins, and breakdown products of such adducts that appear in the urine. Some of these markers indicate more recent exposure (e.g., parent compound in exhaled air), while others are markers of more distant exposure (e.g., hemoglobin adducts). Our objective is to relate the level of the markers in the body in a quantitative manner to prior exposures. It is our hypothesis that the use of a panel of exposure markers, including markers of both recent and earlier exposure, is an effective strategy for relating current levels of biomarkers of exposure to prior exposures. A person who had been exposed to benzene, but not recently, will display markers with long half lives, but no short half-life markers will be present. If both short and long half-life markers are present, but the levels of the longer half-life markers are quite low, the individual has been exposed recently. If the level of the longer half-live markers is relatively high compared to the short half-life markers, the individual must have been exposed for an extended period of time.

Approach:

The half-lives of six biological markers of exposure to benzene will be determined in an animal model (the B6C3F1mouse); a physiologically-based pharmacokinetic model will be developed that can predict the level of the different markers following different exposure scenarios in a quantitative fashion. The model will be modified for human physiological parameters and the model tested in humans exposed to known amounts of benzene. The six biomarkers of benzene exposure to be measured, in order of increasing expected half-lives, will be benzene in exhaled breath, benzene in blood, phenylmercapturic acid and muconic acid in urine, phenylcysteine adducts on blood albumin and phenylcysteine adducts on hemoglobin.

Expected Results:

The utility of multiple markers for assessing prior exposures to benzene will be determined. A battery of biomarkers rather than a single biomarker should provide risk assessors and managers with a more complete picture of the pattern of both recent and prior exposures to chemicals and will lead to better informed decisions in regard to health risks associated with exposure to that chemical.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/886/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/886/report/2000

Type: STAR GRANT
Status: Project Period Concluded
Reports: No Reports Available Yet

Exposure and Response of Morelet's Crocodile (*Crocodylus moreletii*) Populations to Endocrine Disrupting Compounds in Belize, Central America

EPA Grant Number: R826310
Title: Exposure and Response of Morelet's Crocodile (Crocodylus moreletii) Populations to Endocrine Disrupting Compounds in Belize, Central America
Investigators: Scott T. McMurry
Institution: Texas Tech University
EPA Project Officer: David H. Reese
Project Period: December 1, 1997 through November 30, 2000
Project Amount: $159,788
Research Category: Endocrine Disruptors

Description:

Much of the concern regarding endocrine disrupting compounds (EDCs) stems from data showing reproductive impairment and population declines of American alligators (*Alligator mississippiensis*) in Lake Apopka, Florida. The principal objective of this study is to examine exposure and response of another crocodilian, the endangered Morelet's crocodile (*Crocodylus moreletii*), to EDCs in Belize and assess the effect of these chemicals on crocodile populations. In a recent study, we found EDCs, including p,p -DDE, in Morelet's crocodile eggs from three lagoons in Belize. We now hypothesize that crocodiles inhabiting contaminated lagoons contain higher EDC concentrations in their tissues than individuals in non-contaminated areas, and that differences in crocodile morphology, blood hormone levels, serum chemistry, reproductive success, population density, and juvenile survival exist between contaminated and non-contaminated sites.

Approach:

Blood, fat, non-viable eggs and population data will be collected (non-lethally) from crocodiles on contaminated and reference sites to examine exposure and effects of EDCs at the individual and population levels. To assess effects at the individual level, differences in biochemical (plasma testosterone, 17B-estradiol, vitellogenin, serum chemistry) and morphological (penis size) endpoints between contaminated and reference sites will be examined. Crocodile response to EDC exposure at the population level will be assessed by examining differences in endpoints of reproductive success (nesting success, clutch viability) and population structure (density, size structure, sex ratios, juvenile survivability) between contaminated and reference sites.

Expected Results:

When completed, this research will provide much-needed information on the linkage between EDC exposure at the individual level and resulting effects at the population level. Comparison of these data with data from American alligators from Lake Apopka will provide a unique opportunity to examine whether Lake Apopka is a worst-case scenario or if similar reproductive problems and population declines occur in other crocodilian species exposed to EDCs. Moreover, this study will provide valuable insight into the efficacy of reptiles, particularly crocodilians, as sensitive indicators of environmental contamination and ecosystems potentially at risk. This information will be especially useful for ecological risk assessment in tropical countries where reptiles are abundant and regulations governing the use of chemicals, some of them EDCs, are underdeveloped or inadequately enforced.

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1999

Mechanism(s) of Chloroethylene-Induced Autoimmunity

EPA Grant Number: R826409
Title: Mechanism(s) of Chloroethylene-Induced Autoimmunity
Investigators: Neil R. Pumford, Kathleen M. Gilbert
Institution: University of Arkansas for Medical Sciences
EPA Project Officer: David H. Reese
Project Period: March 25, 1998 through March 24, 2001
Project Amount: $374,384
Research Category: Exploratory Research - Human Health

Description:

The development of autoimmune diseases (e.g. rheumatoid arthritis, systemic lupus erythematosus, and systemic scleroderma) is believed to be multifactorial, involving both genetic and environmental components. Chemical exposures may be a major environmental influence on the development of autoimmune diseases. Chloroethylenes are industrial chemicals with widespread occupational exposure and are major environmental contaminants. Furthermore, these chemicals are present at many hazardous waste sites at levels from hundreds of thousands of times higher in ground water to millions of times higher in soils and sediment than EPA's maximum regulatory levels in drinking water. There is good evidence for an association of chlorinated ethylenes such as vinyl chloride, trichloroethylene, and tetrachloroethylene in the causation of a life-threatening autoimmune disorder known as systemic sclerosis-like syndrome, or scleroderma; the mechanism by which chlorinated ethylenes cause this sclerosis-like syndrome is unknown. It is our hypothesis that the development of an autoimmune response in certain susceptible individuals may be precipitated by the metabolic activation of chloroethylene's to reactive intermediates that covalently modify proteins, such as cytochrome P450 2E1, in hepatocytes, clara cells, leukocytes, lymphocytes, and keratinocytes. Covalent binding damages the cells causing the release of chemotactic factors that recruit macrophages, leukocytes, and lymphocytes. The damaged cells also release chloroethylene-modified proteins that are phagocytized, processed and presented by macrophages to T cells specific for the chemical modification. In addition, recruited macrophages and lymphocytes may directly metabolize chlorinated ethylenes to reactive intermediates that covalently bind to the proteins that promote T-cell and macrophage interactions, thereby leading to the release of cytokines that stimulate fibroblasts and lead to the fibrosis and vascular damage observed in chloroethylene-induced scleroderma-like disease.

Approach:

Utilizing antisera specific for proteins covalently modified by chlorinated ethylenes we will investigate the metabolic activation in hepatocytes, clara cells, keratinocytes, macrophages, and CD4+ T cells. Immunohistochemical localization of the adducts within the liver, lung, and skin in MRL/++ mice treated with chloroethylenes will help determine the cells involved in metabolic activation and Western blot analysis of tissue will determine the protein targets. The mechanism of immune-cell activation leading to autoimmunity and fibrosis will be determined in autoimmune-prone MRL/++ mice. Chloroethylene-exposed scleroderma patients will be tested for chloroethylene-modified proteins and/or antibodies directed against modified proteins.

Expected Results:

The results should provide insights into the mechanism(s) involved in chemical-induced autoimmunity and may lead to the development of new treatments for patients with autoimmune diseases, such as the development of new drugs to reduce a critical toxification pathway or to induce a detoxification pathway. Investigation of a non-carcinogen endpoint for chlorinated ethylenes will provide an additional endpoint for evaluating potential human risk. The utilization of biomarkers for chloroethylene exposure will help identify susceptible individuals or populations and is important for risk management. Additionally, the identification of a similar mechanism(s) involved in humans is important for a more precise species extrapolation.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/875/report/1999

Type: STAR GRANT
Status: Completed
Reports: 1998, 2000, Final

Photochemical Processes Controlling Manganese Chemistry in Pristine and Contaminated Mountain Streams

EPA Grant Number: R826649
Title: Photochemical Processes Controlling Manganese Chemistry in Pristine and Contaminated Mountain Streams
Investigators: Diane M McKnight, Duane Hrncir
Institution: University of Colorado at Boulder , The University of Texas at Dallas
EPA Project Officer: S. Bala Krishnan
Project Period: October 1, 1998 through September 30, 2001
Project Amount: $351,175
Research Category: Exploratory Research - Environmental Chemistry

Description:

Mountain streams receiving acid mine drainage are typically enriched in Al, Fe, and Mn. For Fe, photochemical reactions control critical aspects of chemical speciation and transport. We hypothesize that Mn photochemistry is also important in controlling Mn speciation and transport. We will characterize diel variations in Mn speciation and quantify rates of photochemical reactions at the stream scale.

Approach:

Our approach is based upon examining two stream scenarios; 1) a neutral pH stream with high dissolved Mn concentrations in which direct Mn photochemical reactions are expected to be most important and 2) an acidic stream with Fe concentrations greater than Mn concentrations in which Mn chemistry may be controlled by cascading Fe photochemical reactions. We will also measure diel Mn variations in a pristine stream. We will employ laboratory experiments to characterize reaction rates with streambed substrates, will measure rates of microbial processes involving Mn and will conduct in-stream perturbation experiments to probe dominant reactions. For the perturbation experiments we will use conservative tracers to quantify the hydrology and will use reactive solute transport codes (OTIS and OTEQ) to interpret the experiments.

Expected Results:

From this research we will determine the dominant photochemical reactions contributing to the transport of Mn and other trace metals in mountain streams receiving acid mine drainage or other sources of excess trace metals. From our field experiments, we will be able to quantify the processes at the stream scale using reactive solute transport codes. This research will provide important tools for understanding and quantitatively modeling trace metal transport in surface waters. Acid mine drainage is a major water quality problem in several major regions of the United States and these modeling tools will be useful in evaluating the change in in-stream water quality from different pollution abatement approaches.

Progress and Final Reports:

1998 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/349/report/1998

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/349/report/2000

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/349/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1999, 2000, 2001

A Portable Device for Real-Time Measurement of the Size and Composition of Atmospheric Aerosols

EPA Grant Number: R826769
Title: A Portable Device for Real-Time Measurement of the Size and Composition of Atmospheric Aerosols
Investigators: Murray V. Johnston, Gary A. Eiceman
Institution: University of Delaware, New Mexico State University - Main Campus
EPA Project Officer: Paul Shapiro
Project Period: October 1, 1998 through September 30, 2001
Project Amount: $580,963
Research Category: Air Pollution Chemistry and Physics

Description:

The goal of this research is to develop and field test a portable device for real-time size and composition measurements of atmospheric aerosols. Individual particles are sized with a commercial aerodynamic sizer and then ablated with a pulsed laser. Ions produced by the ablation process are analyzed by ion mobility spectrometry. Each particle gives a unique mobility spectrum that can be related to chemical composition. This approach has two important advantages over more familiar methods involving mass spectrometry. First, the mobility spectrometer operates at atmospheric pressure. Since high vacuum pumps are not needed, the size and electrical power requirements of the instrument are greatly reduced. Second, sizing is performed by an industry- standard aerodynamic method. Calibration of the particle size distribution is relatively straight forward, and size-dependent biases of the particle transmission efficiency are minimized. Thus, laser ablation ion mobility spectrometry has great potential as a portable, stand-alone device for correlated size and composition measurements.

Approach:

This project is a blend of instrument development, fundamental investigations of ion mobility spectrometry and field testing. Instrument development will emphasize the adaptation of proven, field-worthy, commercially available technologies toward the goal of correlated size and composition measurements. Once the instrument has been built, fundamental work will be performed to establish and validate the link between mobility spectra and chemical composition of aerosol particles. Important parameters to be investigated include the roles of laser irradiance, particle size, relative humidity and matrix effects on the distribution and mobilities of ions produced by laser ablation. Field testing will be performed in tandem with ongoing investigations of ambient aerosols by mass spectrometry. The instrument developed in this work will be operated side-by-side with an aerosol mass spectrometer and conventional impactor instruments to compare performance.

Expected Results:

Current methods for real-time correlated size and composition measurements are bulky and require substantial electrical power. In contrast, the instrument developed in this work is portable and will not be constrained to specialized measurement sites. Therefore, ambient measurements should be possible over a wide range of locations. The instrument developed in this work will be a research-grade device. In the future, a number of automated instruments could be built and operated for extended periods of time to provide essential data to correlate to epidemiological health indicators. The fundamental work, though not directly related to instrument development, is required to correctly interpret chemical composition data from the instrument.

Improvement in Risk Assessment or Management:

Aerosol particles are important in a variety of air pollution processes. In particular, epidemiological studies suggest a link between particle mass (PM) concentration and human health. There is growing evidence that fine particles are toxic, possibly independent of composition. It is likely that a thorough understanding of health effects will ultimately require more information on the chemical composition of these particles in the atmosphere. Portable instruments, such as the one developed in this work, are needed so that correlated size and composition measurements can be performed at a wide range of locations, independent of specialized service facilities available only at specific sampling sites.

Progress and Final Reports:

1999 Progress Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/393/report/1999

2000 Progress Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/393/report/2000

2001 Progress Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/393/report/2001

Type: STAR GRANT
Status: Completed
Reports: 1999, Final

Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats

EPA Grant Number: R826778
Title: Effect of Ammonium Bisulfate and Carbon Black Particles Inhaled Alone and in Combination on Airway Reactivity in Actively Sensitized Brown-Norway Rats
Investigators: Janet M. Benson
Institution: Lovelace Biomedical & Environmental Research Institute
2425 Ridgecrest Dr.
Albuquerque, NM 87108
EPA Project Officer: Stacey Katz
Project Period: October 1, 1998 through September 30, 1999
Project Amount: $199,035
Research Category: Health Effects and Exposures to Particulate Matter and Associated Air Pollutants

Description:

A growing body of evidence suggests that relatively small, acute increases in the concentrations of airborne particles above the National Ambient Air Quality Standard may be linearly associated with increases in morbidity and mortality in urban populations. The purpose of the research outlined in this proposal is to determine the relationship between increases in airborne aerosol mass concentrations of three models of major components of PM10, ammonium bisulfate, carbon black (a surrogate for fine soot particles), and ammonium bisulfate-coated carbon black, and changes in pulmonary function and airway hyperreactivity, in allergen sensitized Brown-Norway rats. Specifically, we will investigate the influence of the three inhaled pollutant particle types (particle size 0.1 mm) on pulmonary function and airway reactivity in allergen-sensitized male Brown-Norway rats, a rodent model for human extrinsic asthma. We hypothesize that, of the three particle types, acutely inhaled ammonium bisulfate-coated carbon black particles will give a greater airway response than the sum of the responses induced by inhalation of either ammonium bisulfate or carbon black particles alone.

Approach:

Groups of 54 adult male ovalbumin-sensitized rats will be used. After baseline pulmonary function and airway responses to ovalbumin and acetylcholine have been measured, the rats will be exposed in a whole-body inhalation chamber for 6 hours to ammonium bisulfate, carbon black, and ammonium bisulfate coated carbon black particles. Respiratory function and airway challenges will be performed on groups of 10 rats 1?2, 6?8, and 24 hours alter. Groups of 8 rats each will be sacrificed at the same time points to evaluate the extent of inflammation produced. Mean values of total pulmonary resistance, and dynamic lung compliance before and after ovalbumin challenge and the concentration of acetylcholine that increases pulmonary resistance to 200% of control will be calculated for each group. Group differences will be calculated using multivariate analysis of variances, adjusted for multiple comparisons. If statistically significant changes in pulmonary resistance or dynamic lung compliance and airway reactivity in response to allergen specific and nonspecific challenge are not observed, for further acute exposure studies will be conducted and we will proceed with subchronic exposures.

Expected Results:

It is expected that the ammonium bisulfate particles will produce greater airway effects than either ammonium bisulfate or carbon black particles alone. These studies will result in a better understanding of the importance of particle chemistry and combined versus single exposure in influencing pulmonary function, airway hyperreactivity, and susceptibility to allergen-specific and nonspecific airway challenge.

Improvement in Risk Assessment or Risk Management:

These data will better define pollutant particle types that may affect the incidence of asthma attacks and help focus engineering controls and regulatory standards to reduce levels of these emissions.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/244/report/1999

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/244/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: No Reports Available Yet

Airborne Particulate Matter-Induced Lung Inflammation

EPA Grant Number: R826782
Title: Airborne Particulate Matter-Induced Lung Inflammation
Investigators: Andrij Holian, Maria T. Morandi, Edwin Parsley
Institution: University of Texas at Houston
EPA Project Officer: Barbara Glenn
Project Period: October 1, 1998 through September 30, 2001
Project Amount: $674,288
Research Category: Health Effects and Exposures to Particulate Matter and Associated Air Pollutants

Description:

Recent epidemiological studies have reported a statistically significant association between short-term increases in airborne respirable particulate matter (PM) and increased mortality and morbidity from respiratory and cardiovascular disease. Although toxic effects of airborne PM have been demonstrated with a variety of animal models and, to a more limited extent, with human subjects, the mechanism(s) that would explain the reported associations between exposure to PM and adverse health effects remains to be elucidated. Given the results of the epidemiology studies and some of the toxicology data, this mechanism(s) probably involves exacerbation of pre-existing cardiovascular and pulmonary chronic diseases. The very large number of individuals exposed to respirable PM and the lack of an accepted mechanistic hypothesis to explain the reported adverse health effects emphasizes the importance of the current proposed study. We propose that one of the important targets of PM-induced inflammation is the alveolar macrophage (AM). The purpose of this study is to test the hypothesis that fine PM (PM2.5) induce apoptosis of what is termed an immune suppresser population of AM that allows the remaining immune active AM population to more easily activate T helper cells resulting in activation of cytokine cascades and development of lung inflammation. We further propose that these effects would be more pronounced in individuals with chronic lung disease.

Approach:

There are four major goals of this research. Goal 1: To characterize PM2.5-induced apoptosis and phenotype shifts in human AM in vitro and AM apoptosis and T helper cell activation in murine models in vivo. Goal 2: To characterize the influence of age in murine models on the bioactivity of PM2.5. Goal 3: To characterize the effects of PM2.5 on AM apoptosis and phenotype shifts in human AM isolated from patients with chronic lung disease. Goal 4: To characterize the bioactive chemical components of PM2.5 that affect apoptosis and phenotype shifts in human AM and T helper cell activation in murine models. To accomplish these goals PM2.5 will be collected on polyester membrane filters until a sufficient mass (is accumulated for groups of in vitro and in vivo studies. Sites for collection will be representative of industrial, motor vehicle, residential and background sources around Houston as well as sites in El Paso, TX. It is anticipated that approximately 30 separate filter pools will be collected during each year of the study. Particles will be collected in a 12 hr daytime (photochemically derived PM) and nighttime formate at each site. PM collected on filters from same site sampling will be pooled for chemical analysis and biological studies. The PM will be analyzed for metals and organic components. Additional positive and negative control particles will include NIST particles 1648 and 1649, crystalline silica, titanium dioxide and ROFA particles (provided by the EPA). Studies in Goal 1 will be in vitro studies to assess the ability of the PM to cause apoptosis and necrosis of human AM, shifts in AM phenotypes, and stimulation of antigen presenting cell activity. Similar studies (apoptosis and antigen presenting activity) will be conducted in vivo by giving the particles intratracheally to C57Bl/6 and Balb/c mice and will also include measurements of Th1 and Th2 cytokines in the lung lavage fluid. Lung inflammation caused by the various PM will be assessed by differential analysis of lavaged AM and histological examination of perfusion fixed lung sections. Studies in Goal 2 will be in vivo studies with mice using optimal endpoints determined from Goal 1 and will examine very young mice and aged mice obtained from the National Institute of Aging. Studies in Goal 3 will utilize AM obtained from patients with chronic obstructive lung disease, asthma and chronic interstitial lung disease and focus on whether PM are more effective in causing apoptosis, shifts in macrophage phenotypes and stimulation of immune responses in cells from these sensitive subpopulations. Studies in Goal 4 will fractionate PM into water soluble and organic soluble components and test these on human AM in vitro and mice in vivo to determine where the biologically active component of PM is located.

Expected Results:

We anticipate demonstrating that PM will cause a dose-dependent induction of apoptosis in human AM in vitro that will preferentially deplete the suppresser AM population. The remaining population of human AM will be able to more effectively stimulate T helper cells. Similar results are expected in vivo with murine models. Further, we anticipate that AM from young and old mice will be more susceptible to injury than cells from young adult mice. It is also expected that AM obtained from patients with chronic lung disease will demonstrate an even greater shifts of AM phenotypes than cells from healthy subjects. In addition, we propose that we will be able to correlate the potency of PM some component(s) or property of PM.

Type: STAR GRANT
Status: Project Period Concluded
Reports: 2000, 2001

Effects of Inhaled Ultrafine Particles on Asthma

EPA Grant Number: R826785
Title: Effects of Inhaled Ultrafine Particles on Asthma
Investigators: David E. Bice, T. K. Redman, K. J. Nikula, E. B. Barr, Yung-Sung Cheng
Institution: Lovelace Respiratory Research Institute
2425 Ridgecrest Dr. SE
Albuquerque, NM 87108
EPA Project Officer:
Project Period: October 1, 1998 through September 30, 2001
Project Amount: $545,147
Research Category: Health Effects and Exposures to Particulate Matter and Associated Air Pollutants

Description:

Epidemiological studies show that hospital admissions for asthma are positively associated with the concentrations of particulate matter (PM) in the air. However, experimental data are limited to support or contradict the possibility that the inhalation of low concentrations of ultrafine PM increases asthma attacks. Immune and inflammatory cells localized to the lungs of asthmatics respond to inhaled allergens with the production and release of cytokines and mediators that play central roles in asthma attacks. Although the inhalation of allergens usually stimulates the release of these cytokines and mediators, exposures to ultrafine particles may also trigger their release in the lungs of allergic individuals. The objective of the studies described in this proposal is to test two hypotheses: inhaled ultrafine particles trigger asthma attacks 1) directly by stimulating the release of allergic-response cytokines in the lungs of asthmatics, or 2) indirectly by decreasing the concentration of inhaled allergen necessary to cause asthma attacks.

Approach:

Mice that produce allergic immune responses in their lungs to inhaled ovalbumin will be exposed to ultrafine (0.03 μm) carbon particles. Three exposure scenarios will examine the effects of short-term increases in the concentration of ultrafine particles as observed in the environment on the induction of asthma. All three exposures will be at set at 50 μg total particulate material (TPM)/m^3 for 6 h with an increase in the ultrafine particle concentration to 200 μg TPM/m^3 for 1 hr. These scenarios will differ in the time that the particle concentration is increased. The increase to 200 μg TPM/m^3 will start at 1 h, 3 h, or 5 h after the start of the 6 h exposure. The effects of each exposure scenario on the release of allergic cytokines in the lungs and the maximum number of inflammatory cells in lung lavage fluid and lung tissues will be evaluated.

Expected Results:

We expect that inhaled ultrafine particles will stimulate the release of allergic mediators in the lung, and that the increased pulmonary inflammation will reduce the level of inhaled antigen necessary to induce allergic immune responses in the lungs that cause asthma.

Improvements in Risk Assessment or Risk Management: Data from the studies described in this proposal are important to 1) estimate the risk of inhaling ultrafine particles on the induction of asthma attacks in susceptible individuals, and 2) identify potential mechanisms responsible for the increased risk of asthma attacks by inhaled PM.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/246/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/246/report/2001

Type: STAR GRANT
Status: Project Period Concluded
Reports: 2000, 2001

Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments

EPA Grant Number: R826786
Title: Characterization of Factors Determining Personal Exposure to Volatile Air Toxics in Urban Environments
Investigators: N. A. Esmen, T. A. Hall, D. L. Johnson, M. L. Phillips
Institution: University of Oklahoma Health Sciences Center
EPA Project Officer: Stacey Katz, Gail Robarge
Project Period: October 1, 1998 through September 30, 2001
Project Amount: $559,352
Research Category: Urban Air Toxics

Description:

Previous studies have provided valuable information regarding which sources actually contribute significantly to personal exposure to ambient air toxics, and what factors affect the relative weighting of these sources. However, in order to develop generalized models for estimating personal exposure within and among broad populations, it is necessary to employ a more advanced study design that will investigate the effects of external factors on personal activity patterns and exposure levels. The primary objective of this project is to investigate how external factors influence the relationship between personal exposures and area measurements of air toxics.

Approach:

Using a multi-city, multi-season, two-level fractional factorial design, we will study the distribution of personal exposures in relation to eight dichotomous macroenvironmental and household factors which are hypothesized to influence personal activity and exposure patterns. The factors studied will be: size of urban area, degree of industrialization, high vs. low and mild vs. extreme seasonal temperature, presence or absence of precipitation, workday vs. leisure day, presence or absence of children in the household, and socioeconomic status. The highly efficient factorial design will allow the effects and interactions of these factors to be assessed using at most 256 monitoring periods spread over about two years. The monitoring will be conducted in about 100 volunteer households recruited in four Oklahoma cities. Only non-smoking households in single-family dwellings will be included. One adult 21-50 years of age in each household will be selected randomly for personal exposure monitoring. Personal and area hazardous air pollutant (HAP) exposure measurements will be performed indoors and outdoors over 24-hr periods for a number of volatile organic compounds (VOC), including benzene, toluene, ethylbenzene, xylenes, styrene, n-hexane, and 2,2,4- trimethylpentane. VOC concentrations will be assessed for 12-hr periods. Subjects will keep diaries to document personal activities of study subjects, and diaries will be supplemented by precise location tracking using Global Positioning System (GPS) technology. In addition, residences will be characterized regarding resistance to infiltration/exfiltration. A pilot study on the use of multi-stage piezoelectric microbalance impaction for the characterization of hourly indoor and outdoor fine particulate matter size distributions will also be performed at study residences.

Expected Results:

The primary expected outcome of this work is a resolution of fundamental questions regarding the underlying assumptions of previous HAP exposure assessment approaches. The extensive number of well-planned measurements will also have ancillary benefits. By introducing eight contrasts and five generic measures, with the exposure values split into two 12-hr segments, we will be in a position to estimate relative contribution levels for HAP sources.

Improvement in Risk Assessment or Risk Management:

The results are expected to produce a model that can be used to define exposure models for other populations. Both as a fundamental study and as an applied investigation of exposure parameters and levels, the data generated are expected to provide a significant scientific basis for understanding exposure mechanisms to air toxics.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/225/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/225/report/2001

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1999, 2000, 2001

CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys

EPA Grant Number: R826939
Title: CISNet: Coral Bleaching, UV Effects, and Multiple Stressors in the Florida Keys
Investigators: Susan L. Anderson, Richard Zepp, Debbie Santavy
Institution: University of California - Davis
EPA Project Officer: Gina Perovich
Project Period: October 1, 1998 through September 30, 2001
Project Amount: $407,567
Research Category: Monitoring Program on Ecological Effects of Environmental Stressors Using Coastal Intensive Sites

Description:

Elucidating interactions between climate, anthropogenic stressors, and damage to significant natural resources is a primary goal of CISNet. We will evaluate the role that climate change may play in altering penetrance of UV radiation over coral reefs and potentially contributing to coral bleaching. Our studies will be conducted at intensively monitored sites in the Florida Keys National Marine Sanctuary (FKNMS). Thus, our work will add to ongoing investigations of stressors in coral related to coral disease and impaired water quality. Data available from programs in the FKNMS will also help us characterize temperature and light conditions at our sites in a cost-effective manner. Global climate change may contribute to coral bleaching because thermal stratification causes both increased temperature and increased penetration of UV light associated with photobleaching. Both of these stressors are believed to contribute significantly to coral bleaching.

Approach:

The remote sensing component of the proposal will first characterize underwater solar UV irradiance and the factors that modify UV exposure in corals. Characterization of diffuse attenuation coefficients under stratified and unstratified conditions will help to determine whether increased stratification and photobleaching cause increased UV irradiance over corals. Secondly, we will develop continuous observations of chromophoric dissolved organic matter concentrations (CDOM) and algorithms that relate measured CDOM concentrations to sea surface UV irradiance (predicted by remote-sensing and land-based radiometers). These efforts could be utilized to predict sites affected by increased UV and may eventually be related to coral bleaching.

In the coral stressors component of the proposal, we will utilize biomarker techniques to examine UV-specific DNA damages (thymine dimers) in relation to coral bleaching. We will also use these techniques to characterize temperature and UV interactions under controlled conditions. A monitoring study will be conducted in the FKNMS using Mote Marine Laboratory-Pigeon Key Marine Research Center (PKMRC) as the base of investigations with additional sampling in the Key West area and the Dry Tortugas National Park. The primary goals of this investigation are to determine whether: 1) temperature or UV irradiance/ thymine dimers better predict the occurrence of coral bleaching in field populations and 2) levels of thymine dimers and coral bleaching vary significantly under stratified and unstratified conditions. If significant positive correlations between UV exposure, thymine dimers, and coral bleaching are observed, this would be the most thorough analysis we know of indicating that increased UV irradiance associated with climate warming may have damaging effects on corals. To our knowledge, no previous studies have employed state-of - the-art molecular techniques to quantify UV-specific DNA damages in coral, utilizing these responses as "ecosystem indicators". The proposed investigation involves extensive collaboration between the PI and federal researchers. Matching funds in excess of $100,000 per year are provided by EPA.

Expected Results:

This research should result in significant advances in our understanding of the etiology of devastating increases in coral bleaching in the Florida Keys, the third largest barrier reef in the world.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/438/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/438/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/438/report/2001

Type: STAR GRANT
Status: Completed
Reports: 1999, 2000, Final

Environmental Condition On-Line DFW Metroplex (ECOPLEX)

EPA Grant Number: R827065
Title: Environmental Condition On-Line DFW Metroplex (ECOPLEX)
Investigators: Kenneth L. Dickson, Howard Martin, Samuel F. Atkinson, William T. Waller, James H. Kennedy, Miguel F. Acevedo
Institution: City of Denton , University of North Texas
EPA Project Officer: Madalene Stevens
Project Period: November 1, 1998 through October 31, 2000
Project Amount: $484,868
Research Category: Environmental Monitoring for Public Access and Community Tracking (EMPACT)

Description:

The objective of the ECOPLEX proposal is, through the use of both innovative and proven environmental monitoring technologies, to collect real time and time relevant environmental data which will be used to inform the citizens of the City of Denton, the Elm Fork watershed and the Dallas/Fort Worth metropolitan area of current, historical and near-term forecasts of environmental conditions to which we are exposed. We propose a suite of parameters encompassing the most pressing environmental issues this region is faced with: water, land and air. These parameters include real time measures of clam gape, water quality (pH, temperature, dissolved oxygen, conductivity), predicted chlorophyl, wind speed, air temperature, and rainfall, which will be monitored at a site in Lake Lewisville and Pecan Creek?a tributary to Lake Lewisville. Ozone concentrations, ultraviolet light levels, and air clarity will be monitored at the Environmental Education and Science and Technology building on the campus of the University of North Texas. These parameters will clearly communicate time-relevant data for one of the largest metropolitan areas in the country, assisting our citizens in making environmentally responsible decisions. Our objectives are to combine a suite of proven technologies for measuring certain environmental parameters with a suite of innovative technologies recently explored by university researchers to present our community with a comprehensive "systems" view of our environment.

Approach:

Our approach is two-fold: first, we intend to post on the world wide web a series of graphical indices of each parameter measured (as well as combined indices indicating overall system quality), with links to movies depicting the recent history of each parameter and predictions of near future conditions. As important as the technological first step is, providing the community with the knowledge of how to use the information is even more important. Therefore, our second approach is to develop curriculum which will be delivered to the community, especially school-aged children, via an intensive outreach program. We will hire teachers to develop curriculum and conduct monthly workshops for teachers to show how to utilize the information in classrooms, how people should view the information, and how to make environmentally responsible decisions based on that information.

Expected Results:

Our intent is to provide a finely woven tapestry of technology which measures the quality of the environment and tools which allow the community to understand how to interpret that information. This project will result in a community which understands the interrelated nature of our environment as well as past, present, and future conditions.

Relevant Websites:
http://www.ecoplex.unt.edu

Progress and Final Reports:

1999 Progress Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/428/report/1999

2000 Progress Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/428/report/2000

Final Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/428/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1999, 2000, 2001

Theoretical Evaluation of the Interfacial Area between Two Fluids in Soil

EPA Grant Number: R827116
Title: Theoretical Evaluation of the Interfacial Area between Two Fluids in Soil
Investigators: Steven Bryant
Institution: University of Texas at Austin
EPA Project Officer: S. Bala Krishnan
Project Period: October 1, 1998 through September 30, 2001
Project Amount: $246,378
Research Category: Exploratory Research - Physics

Description:

Nonaqueous phase liquids (NAPLs) are among the primary sources of contamination of groundwater. The overall rate of mass transfer of a chemical species between a NAPL and an aqueous phase is a critical parameter in assessing risk from a given contaminant source, in designing remediation strategies, and in interpreting results from allied technologies such as interwell partitioning tracer tests used to assess the volume of NAPL in place. The rate of mass transfer depends upon the thermodynamic driving force and the area of the interface between the phases. The interfacial area depends very strongly upon the geometry of the pore space of the host soil or rock and is consequently very difficult to measure directly. This project will develop a novel mathematical modeling technique to predict the interfacial area from first principles.

Approach:

The configuration of fluid phases in a porous medium, and hence the interfacial area, is governed by the pressure difference between the phases and by the geometry of the pore space. In naturally occurring granular porous media the locations of the grains are random, and consequently the pore space is highly irregular. This is the principal obstacle in obtaining quantitative predictions of interfacial area. The proposed research overcomes this obstacle by using a physically representative and geometrically determinate porous medium: the random, dense packing of equal spheres described by Finney. This packing, and numerical modifications of it, have proven to be excellent models of the pore structure in well-sorted sands and sandstones, permitting quantitative *a priori* predictions of transport properties and capillary phenomena. Previous research has yielded techniques for uniquely locating pore throats and pore bodies in the packing, for extracting network representations of the pore space and for simulating both drainage and imbibition in these networks. These simulations provided only approximate phase volumes. We propose to refine these techniques to provide more accurate phase volumes and to compute for the first time interfacial areas. This will be done by computing the local configuration of the phases on a pore-by-pore basis; this is feasible because the global capillary pressure is known at any time during imbibition/drainage and the geometry of every pore is known. The predictions can be validated by measurements from a recently published technique employing interfacial tracers.

Expected Results:

Based on the success of previous applications that used physically representative model porous media, this research should yield quantitative predictions of interfacial surface area in simple granular porous media. The results will be presented as functions of the phase volume fractions for both drainage and imbibition. The fundamental understanding obtained from these predictions will serve as a guide to evaluating laboratory and field data. In particular, it will be possible to extract the intrinsic mass transfer coefficient from the lumped mass transfer coefficient which is typically obtained from column experiments, and this will greatly enhance the ability to extrapolate laboratory data to field applications. Predictive models of fluid interfacial area in porous media will also enhance the predictive capability of existing models of subsurface multiphase transport, which often do not account for variation in interfacial area. Improved transport models will yield more reliable assessments of contamination risks and remediation strategies for NAPL sites.

Relevant Websites:
http://www.ticam.utexas.edu/CSM/EPA/area/index.html
http://www.ticam.utexas.edu/CSM/EPA/connectivity/index.html
http://www.ticam.utexas.edu/CSM/EPA/critcurv/index.html

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/406/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/406/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/406/report/2001

65

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1999

Development of a New Gas Sensing System Based on Terahertz Time-Domain Spectroscopy

EPA Grant Number: R827122
Title: Development of a New Gas Sensing System Based on Terahertz Time-Domain Spectroscopy
Investigators: Daniel M. Mittleman, Richard G. Baraniuk
Institution: Rice University
EPA Project Officer: Paul Shapiro
Project Period: October 1, 1998 through September 30, 2001
Project Amount: $299,817
Research Category: Environmental Engineering

Description:

Spectroscopic methods for the sensing and identification of gases have shown great promise, owing to their inherent non-invasive nature, relative simplicity, and high selectivity. The use of *far-infrared* or *terahertz* (1 THz = 1012 Hz, corresponding to a wavelength of ~300 μm) radiation for sensing purposes, though extremely valuable as a complement to well established mid-infrared technologies, has not achieved great success. This is largely due to the complexity of the instrumentation required for generation and detection of terahertz radiation, which renders existing spectrometers impractical for most real-world sensing applications. The objective of this research is to build a portable broadband spectrometer based on the recently developed technique of *terahertz time-domain spectroscopy* (THz-TDS).

Approach:

The task of constructing a rugged, reliable, and portable THz-TDS system can be divided into two broad areas, both of which are addressed in this proposal. The first deals with hardware aspects, particularly the femtosecond laser system required for THz generation. The THz-TDS technique must be adapted for operation with a mode-locked fiber laser. This will require the development of new methods for THz generation, involving either new semiconductor materials or efficient frequency doubling of the fiber laser. Also, novel chirped-pulse electro-optic sensing techniques will be developed for compatibility with fiber coupling. The second involves the development of algorithms for signal processing of the THz waveforms. Methods based on wavelet processing are expected to be particularly well suited for these signals, owing to the strong resemblance of the measured waveforms to elements of a wavelet basis.

Expected Results:

A portable and reliable far-infrared spectrometer will be built and tested. This system will be driven by a mode-locked fiber laser, and will therefore be largely insensitive to external perturbation, optical alignment issues, etc. The newly developed signal processing procedures will be incorporated into the software used to drive the real-time data acquisition system. Collection of training data on a number of gases of interest will begin. This will be useful for subsequent tests for determining the sensitivity of the system, as well as for an assessment of the progress of this project. This prototype system will be suitable for field tests in a wide range of industrial environments.

Improvement in Risk Assessment or Risk Management:

The development of a commercially viable far-infrared gas sensing system will be very much complementary to the well established techniques based on vibrational spectroscopy. Whereas those systems are extremely good at sensing numerous smaller molecules, such as many greenhouse gases, they often find difficulty in identifying larger molecules, for which the vibrational ?fingerprint' region exhibits highly complex and structured spectra. The far-infrared spectra of these molecules are often far less complicated, as only the rotational degrees of freedom are involved. As a result, identification based on terahertz ?fingerprint' spectroscopy is often easier with larger polar molecules. Many candidate molecules are commonly used in industrial applications, including solvents such as acetonitrile, acetone, and trichloroethane, halogenated benzenes, and many chlorofluorocarbons. Industrial users are required to monitor the release of these species into the environment, and will undoubtedly benefit from the availability of a real-time monitoring system such as the one whose development is proposed here.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/351/report/1999

Type: STAR GRANT
Status: Project Period Concluded
Reports: 1999, 2000

Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning

EPA Grant Number: R827147
Title: Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration Planning
Investigators: Marty D. Matlock, Charles D. Samuelson, William H. Neill, Tarla Rai Peterson, Ann L. Kenimer, Guy D. Whitten
Institution: Texas A & M University
EPA Project Officer: Bill Stelz
Project Period: October 1, 1998 through September 30, 2001
Project Amount: $838,767
Research Category: Water and Watersheds

Description:

We will develop and test a method for restoring the ecological integrity of urban watersheds that combines ecology, engineering and social science. Research questions to be addressed include 1) Can a risk-based watershed model linked with two eco-indicators in a regressive ecological risk assessment for a complex watershed quantify the uncertainty associated with ecosystem rehabilitation?; 2) Will stakeholders' understanding of non-point source pollution (NPS) issues, ability to use scientific information about TMDLs, and communication competence improve as a result of Collaborative Learning (CL) intervention? A watershed model of ecological risk assessment will be developed. Models of stakeholder knowledge levels, environmental attitudes, and compliance patterns will also be developed.

Approach:

Our approach integrates ecology, engineering and social science. A watershed model linked with an in-stream model has been developed to evaluate and optimize ecosystem management strategies. Two integrated eco-indicators will be used to evaluate and communicate risk to the stakeholder group. This risk-based model will be used to initiate discussions between stakeholders and scientists in an iterative process that will result in an informed and stakeholder-driven action plan for watershed rehabilitation. Social dilemma/game-theoretic analysis will be used to develop models of compliance under different assumptions about time and other actors' behaviors. A simulation of the interactive effects of human and non-human factors on watershed nutrient levels will be developed.

Expected Results:

This work will provide a system-based set of tools for quantifying the uncertainty associated with nutrient pollution control at both the physical and social levels. The models that will result from the work can be used to facilitate the development of more effective pollution control approaches.

Improvement in Risk Assessment:

This project will provide a more sophisticated framework for the guidance and evaluation of watershed-level decision making on TMDLs.

Relevant Websites:
http://www.agen.tamu.edu/sara/

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1011/report/1999

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1011/report/2000

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Type: STAR GRANT
Status: Project Period Concluded
Reports: 1999, 2001

Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System

EPA Grant Number: R827168
Title: Social Impact Assessment of Human Exposure to Mercury Related to Land Use and Physicochemical Settings in the Alabama-Mobile River System
Investigators: Jean-Claude J. Bonzongo, Eric E. Roden, Hobson C. Bryan, W. Berry Lyons, Milton G. Ward, Indrajeet Chaubey
Institution: Austin College , University of Alabama - Tuscaloosa
EPA Project Officer: Bill Stelz
Project Period: December 21, 1998 through December 20, 2001
Project Amount: $804,534
Research Category: Water and Watersheds

Description:

Mercury (Hg) concentrations above levels that could pose a health risk have been measured recently in predatory fish from many rivers and reservoirs in the southeastern region of the United States. This sector of country is particularly vulnerable to Hg contamination in aquatic food chains due to the coexistence of natural and human-imposed conditions hypothesized to enhance the transformation of inorganic Hg to methyl-Hg, its most toxic and readily bioavailable form.

This research has two primary thrusts: (1) to explore geochemical and biological aspects of Hg cycling and contamination in selected watersheds in the Mobile- Alabama River System (MARS); and (2) to lay the groundwork for remedial policies through a social science-based process of social impact assessment and public involvement. Specific objectives are to: (i) improve our understanding of Hg biogeochemistry and its accumulation in biota within the MARS; (ii) use this information to help predict the potential for Hg bioaccumulation in areas with similar geochemical and geographical features; (iii) inform and involve key stakeholder groups regarding the science of Hg contamination and its human implications; and (iv) lay the groundwork for public understanding and support of possible remedial measures.

Approach:

We will examine the biogeochemistry of Hg in different types of aquatic environments within the MARS, which we hypothesize will have contrasting levels of methyl-Hg in water and biota based on the following arguments. First, land use and human modifications of the hydrology of rivers by the construction of dams have resulted in increased nutrient loading into streams/rivers and increased sedimentation rates near water impoundments, respectively, allowing the accumulation of organic rich particles and the development of anoxic conditions favorable to transformation of inorganic Hg to methyl-Hg. Second, the abundance of shallow-water wetlands in catchments of many river/reservoir systems in the MARS may be a significant source of methyl- Hg to parallel and downstream aquatic systems. Therefore, inorganic Hg introduced to the MARS from both point sources and discrete atmospheric deposition would easily build up in aquatic food chains, particularly in dammed locations receiving industrial, agriculture or municipal runoff and/or water inputs from surrounding wetlands. Finally, since the findings of this study may result in appropriate regulatory responses, our plan includes the involvement of the public in the assessment of risk imposed by elevated Hg levels in fish and the design of policy recommendations for remedial measures.

Expected Results:

This research project is expected: (1) to provide an assessment of Hg biogeochemistry with an overall goal of achieving an improved understanding of the impact of land use, dams and natural settings such as wetlands on Hg cycling; and (2) to discern the policy implications of these findings to achieve effective remedial strategies. The results of our research/spatial analysis in the MARS will have direct transferability to other areas with similar geochemical and geographical features, and will help predict the potential for Hg bioaccumulation in aquatic biota (e.g., other areas within the state and in neighboring states in the Southeast).

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/589/report/1999

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/589/report/2001

Type: STAR GRANT
Status: Project Period Concluded
Reports: 2000, 2001

Evaluation of Endocrine-Distrupting Chemical Effects Across Multiple Levels of Biological Organization: Integration of Physiology Behavior and Population Dynamics In Fishes

EPA Grant Number: R827399
Title: Evaluation of Endocrine-Distrupting Chemical Effects Across Multiple Levels of Biological Organization: Integration of Physiology Behavior and Population Dynamics In Fishes
Investigators: Peter Thomas
Institution: University of Texas at Austin
EPA Project Officer: David H. Reese
Project Period: October 1, 1997 through September 30, 1999
Project Amount: $862,290
Research Category: Endocrine Disruptors

Description:

The overall aim of the proposed research is to understand the nature, extent and mechanisms of reproductive and endocrine toxicity of a representative xenobiotic estrogen, o,p'-DDT, and a putative xenobiotic antiandrogen, p,p'-DDE, in an established vertebrate model, the teleost Atlantic croaker. The following specific hypotheses will be tested: (1) Embryological development, gonadal differentiation, puberty and gonadal growth are sensitive stages of the teleost reproductive life history cycle to disruption by estrogenic and antiandrogenic chemicals; (2) The reproductive toxicities of o,p'-DDT and p,p'-DDE in both male and female croaker are primarily due to their estrogenic and antiandrogenic activities, respectively; (3) Endocrine disruption in males by xenoestrogens is mediated by their binding to the testicular estrogen receptor (ER) and disruption by antiandrogens in females is caused by binding to the ovarian androgen receptor (AR) in addition to the more traditional sites of estrogen and androgen action on the hypothalamus-pituitary-gonadal-liver axis; (4) Males in general are more sensitive than females to the reproductive effects of estrogenic chemicals.

Approach:

The effects of in vivo administration o,p'-DDT will be compared to those of a synthetic estrogen, diethylstilbestrol and the effects of o,p'-DDE will be compared to those of an antiandrogen, cyproterone acetate (hypothesis 2). The effects of both DDT analogs will be compared to those of p,p'-DDD which does not bind to either the ER or AR in croaker (hypothesis 2) and a DDT mixture which approximates the analog composition in fish samples collected from the Southern California Bight. Both male and females will be exposed to the model compounds throughout their life cycles to obtain a comprehensive understanding of how chemicals impair teleost reproduction (hypothesis 1) and which reproductive life cycle stage is the most sensitive (hypothesis 4). Indices of reproductive function such as gametogenesis, sex differentiation, hatching success and sperm motility, as well as indices of endocrine function such as steroid and gonadotropin secretion and receptor concentrations will be measured after exposure to the model compounds. The sites of estrogen action will be determined by in situ hybridization of the ER mRNA and androgen action by AR assays (hypothesis 3). Estrogenic and antiandrogenic actions of the model compounds will be assessed by specific assays (hypothesis 2). Interactions of the model compounds with the ER and AR and will be examined in competition studies (hypothesis 2 and 3).

Expected Results:

It is expected that the results will support the 5 hypotheses outlined above. We expect to demonstrate for the first time the involvement of an ER in fish testes in mediating the adverse effects of xenobiotic estrogens on testicular function and the involvement of the AR in mediating the toxic actions of antiandrogens on ovarian function in vertebrates. These studies are expected to provide mechanistic explanations of how xenoestrogens and xenobiotic androgens can interfere with gonadal sex differentiation and reproductive development and induce feminization in fish and wildlife. The mechanisms of toxicity are expected to be similar to those reported in mammals and therefore can be extrapolated to other vertebrate groups. Our findings will be valuable for conducting risk assessments by state and federal agencies, especially for DDT contamination in fish populations in the Southern California Bight.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/450/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/450/report/2001

Type: STAR GRANT
Status: Completed
Reports: 2000, Final

Exploring the Environmental Impacts of the E-merging Digital Economy: Towards an Informational Ecology for the Greening of Electronic Commerce

EPA Grant Number: R827582
Title: Exploring the Environmental Impacts of the E-merging Digital Economy: Towards an Informational Ecology for the Greening of Electronic Commerce
Investigators: Daniel Z. Sui
Institution: Texas A & M University
EPA Project Officer: Bill Stelz
Project Period: October 1, 1999 through September 30, 2000
Project Amount: $69,777
Research Category: Futures

Description:

The objective of this project is to unpack the paradoxical relationship between the digital economy and the environment by addressing three key questions: 1. To what extent and under what circumstances, is the electronic delivery of goods and services going to substitute, complement, or synergistically integrated with traditional ways of doing business? 2. What are the environmental consequences, measured in terms of energy/material consumption and waste production, of using the Internet to deliver information-based products or services? 3. What are the environmental consequences, measured in terms of energy/material consumption and waste production, of using the Internet to facilitate the retailing of tangible goods and products?

Approach:

By extending previous works in industrial ecology, this project develops an informational ecology approach as the guiding analytic framework. Detailed environmental life-cycle analysis (LCA), including inventory, impact, and improvement assessment, will be conducted for both the digital delivery of information-based products and the retails sale of tangible products over the Internet.

Expected Results:

EPA should expect a ground-breaking development in information ecology - a new conceptual and analytical framework that can be operationalized in practice to systematically examine the environmental impacts of the emerging digital economy. This research will also provide recommendations to EPA on how to conduct environmental audit for electronic commerce and to companies doing cyber-businesses how to create a synergy between industrial metabolism and information processing to increase their eco-efficiency of all their operations.

Progress and Final Reports:

2000 Progress Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/990/report/2000

Final Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/990/report/F

Type: STAR GRANT
Status: Project Period Concluded
Reports: 2000, 2001, 2002

Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments

EPA Grant Number: R827677
Title: Regional Ecological Resource Assessment of the Rio Grande Riparian Corridor: A Multidisciplinary Approach to Understanding Anthropogenic Effects on Riparian Communities in Semi-arid Environments
Investigators: Jay Raney, Jeri Sullivan, Melba Crawford, Amy Neuenschwander, Gene Paull, Javier Gonzales-Ramos, Frank Judd, Eric Rieken, Robert Lonard, Thomas Tremblay
Institution: University of Texas at Austin , University of Texas - Pan American , University of Texas at Brownsville
EPA Project Officer: Gina Perovich
Project Period: September 1, 1999 through August 31, 2002
Project Amount: $642,496
Research Category: Regional Scale Analysis and Assessment

Description:

The objectives of this study are to: 1) acquire and analyze high-resolution remotely sensed data from multiple sensors; 2) integrate existing and new field data and remotely sensed data into a Geographic Information System (GIS) to map the riparian vegetation of the lower reach of the Rio Grande; 3) ascertain whether the native communities are maintaining themselves and identify the topographic, edaphic, and other ecological factors that perpetuate these communities; 4) interpret spatial variations in riparian habitats, including comparisons of the northern and southern banks of the Rio Grande; 5) analyze temporal changes at specific locations; 6) develop a foundation for future analysis of riparian floodplain communities by linking local and remotely sensed regional data using a GIS.

Approach:

The study area includes the lower reach of the Rio Grande from Falcon Dam to the mouth of the river in Cameron County. First, existing, detailed local- scale (0.5-1 m) ecological data in the form of transect statistics for dominant riparian vegetation will be, correlated with existing high-resolution videography and CASI multispectral data (0.5-4 m scale) to delineate the spatial extent of the riparian community. This will provide ground truth for the classification of high-resolution (4-7 m) hyperspectral and synthetic aperture radar (SAR) data. Classification output from high-resolution imagery will in turn provide the class mixtures for medium-resolution (20-30 m) Landsat TM and SPOT multispectral data that cover the entire study area, on both sides of the Rio Grande. Existing data on geology, soils, water quality, and hydrology, and topographic information from TOPSAR, as well as laser altimetry data acquired for the study, will be investigated as additional inputs to the classification process and used to help explain temporal and spatial changes in ecological resources indicated in the remotely sensed data. Methodologically, we will evaluate the potential benefits of multiple classification approaches, including multi-resolution neural networks, fuzzy Bayesian classifiers, and contextual classification algorithms. We will use GIS-based spatial models and statistical modeling techniques to assess how information gathered at fine scales in intensive, local studies can be extrapolated to broad scales for ecological monitoring and landscape change analysis.

Expected Results:

Model results will be used to predict the expected future effects of landscape change on plant distributions and community biodiversity and functional organization at multiple scales of resolution. Methodologies will be developed to guide future assessments of riparian regions. This project will help link local, riparian data with regional remote sensing data in a unique location that is undergoing extensive environmental change, while providing the opportunity to evaluate the potential for multiresolution analysis of an extensive multisensor, remotely sensed data set.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/456/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/456/report/2001

2002 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/456/report/2002

Type: STAR GRANT
Status: Project Period Concluded
Reports: 2000, 2001

Ferric Oxide/Alkali Metal Oxide Induced Oxidation of CHCs in Polluted Gas Streams

EPA Grant Number: R827719
Title: Ferric Oxide/Alkali Metal Oxide Induced Oxidation of CHCs in Polluted Gas Streams
Investigators: Barry Dellinger
Institution: Louisiana State University - Baton Rouge
EPA Project Officer: Paul Shapiro
Project Period: September 1, 1999 through August 31, 2002
Research Category: Environmental Engineering

Description:

With the more stringent MACT standards for control of toxic air pollutants and VOCs, there is an ever increasing emphasis on developing higher efficiency, more cost effective control technologies. Carbon absorption and noble metal catalysts systems have been frequently employed but suffer from several important problems. Noble metal catalysts are costly, subject to fouling, and are not very effective on chlorinated hydrocarbons (CHCs), while carbon absorption only transfers the pollution burden to a new medium. We have recently begun to study ferric oxide/alkali metal oxide based catalysis systems and generated initial data that indicates they can be effectively used to destroy CHCs and hydrocarbons with efficiencies of >99% at temperatures of 400 to 500?C. Preliminary data indicates that no organic by-products are produced and HCl/Cl2 can be captured by the alkali metal oxide component of the support. *We propose to determine the mechanism of activity of this system and determine its utility as a practical control technology for CHCs in polluted gas-streams.* Our research objectives include:

- Determination of the range of applicability of the catalytic system to CHCs (and selected hydrocarbons) of varying molecular weight and electronic structure.
- Examine the nature of the interaction of the pollutant with the surface and through observation of stable reaction products and intermediates, and develop a mechanistic and reaction kinetic model for the catalytic destruction of CHCs.
- Vary the catalyst/support composition and manufacturing technique to arrive at an optimized formulation.
- Using reaction kinetic and performance models along with selected key experiments, devise a conceptual design for a working practical system.

Approach:

We will utilize a specially designed and constructed gas-solid reactor equipped with an in-line GC-MS analytical system to evaluate the performance of the catalyst. Resonance Raman, XPS, and reflectance FTIR will be used to probe the catalyst surface for reaction intermediates to discern mechanistic information. Surface CHEMKIN reaction kinetic and reactor performance models will be employed to model the performance of the catalyst system and scale it to a practical, working system. CHCs and hydrocarbons of varying molecular structure will be used as test materials to determine the mechanism of reaction and the scope of applicability.

Expected Results:

If successful, we will have developed a catalytic system that is efficient for normally recalcitrant CHCs as well as hydrocarbons that is also low cost and robust. It could be applied to numerous industrial effluent streams, including CHC manufacturing wastes, as well as combustion systems where control of polychlorinated dibenzo-p-dioxins and furans (PCDD/F) is of concern.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/982/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/982/report/2001

Type: STAR GRANT
Status: Project Period Concluded
Reports: 2000

Municipal Sewers as Sources of Hazardous Air Pollutants

EPA Grant Number: R827930
Title: Municipal Sewers as Sources of Hazardous Air Pollutants
Investigators: Richard L. Corsi
Institution: University of Texas at Austin
EPA Project Officer: Stacey Katz , Gail Robarge
Project Period: January 1, 2000 through December 31, 2002
Project Amount: $298,798
Research Category: Urban Air Toxics

Description: There are greater than 15,000 publicly owned treatment works (POTWs) in the United States. These POTWs serve as pathways for the discharge of hazardous compounds in all urban areas and are potentially important with respect to urban air toxics for two reasons. First, the composition of hazardous air pollutants (HAPs) observed in wastewater provides a qualitative "snap shot" of the non-mobile use of such chemicals in urban areas. Second, sewers themselves may serve as important distributed (area) sources of volatile HAP emissions. Several HAPs that are commonly emitted by POTWs include toluene, ethylbenzene, xylenes, benzene, methylene chloride, chloroform, and tetrachloroethene. Additional compounds such as methyl-t-butyl ether (MTBE) are also observed at relatively high concentrations in some municipal wastewater. While the concentrations of most of these HAPs are typically observed at less than 10 to 20 mg/L in the influent streams of treatment plants, the large volumes of wastewater that are collected suggest that significant mass discharges and airborne emissions may occur from municipal sewers. Furthermore, the concentrations that are observed at the influent to treatment plants may be significantly lower than corresponding concentrations in sewers if significant emissions occur from the latter. The primary objectives of this study are to assess whether municipal sewers are significant area sources of HAPs, and whether such emissions can lead to localized "hot spots". Specific objectives include (1) development of a database that includes measured stripping efficiencies for a wide range of volatile chemicals in municipal sewers, (2) estimation of HAP emissions from a large urban sewer network, and (3) comparison of such emissions with other known sources of HAPs.

Approach: Task 1 will involve a series of experiments to track the migration and partitioning of several tracers over distances of 3 to 10 kilometers in operating sewers in Austin, Texas. At least four tracer chemicals will be used and will span a wide range of Henry's law constants. Four separate reaches (series of reaches) will be tested twice each for a total of eight experiments. Chemicals will be pre-dissolved in water and injected into a submerged diffuser system in the underlying wastewater. Rodamine dye will be injected from a second reservoir (drum), and will facilitate estimates of axial dispersion and wastewater flow rates. Wastewater and sewer headspace samples will be collected at several locations along the downstream flow path, including the head works of the treatment plant that serves each of the sewers to be tested, with subsequent analysis using gas chromatography. The experimental database will be used to ascertain the degree to which volatile HAPs are removed from wastewater prior to reaching a treatment plant. The data will also be used to evaluate two models (CMBA and naUTilus) that have been developed, but not evaluated based on field data, to estimate VOC emissions from sewer networks.

Task 2 will constitute the first rigorous modeling effort to predict volatile HAP emissions from a large and integrated municipal sewer system. The CMBA and naUTilus models will be used to predict volatile HAP emissions from an entire (or large section of) urban sewer network in Houston, Texas. This effort will involve extensive data collection regarding physical sewer system design, wastewater flow rates, locations and types of dischargers to the system, and mass discharge rates. Predicted emissions will be compared with other known sources of HAPs in the Houston Metropolitan area, including emissions from POTW treatment facilities. The modeling effort is expected to lead to the identification of localized emission "hot spots".

Task 3 will involve a field study to investigate emission " hot spots" that are identified during task 2. At selected sites, two headspace air samples will be collected as a pre-screening for the occurrence and concentrations of volatile HAPs. A set of three to six sites will be selected for study, depending on the relative magnitudes of predicted emissions and pre-screening concentrations at each site. Each event will occur over two or more days, and will involve the collection of wastewater samples in sewer(s) upstream and downstream of the predicted hot spot. Gas samples will be collected in the sewer headspace at one or more locations in the vicinity of each hot spot, depending on the sewer configuration, and will be multiplied by headspace air exchange rates to estimate mass emissions. Headspace exchange rates will be determined based on anemometry and selective addition and analysis of sulfur hexafluoride (SF6). One or more of the hot spots will be selected for additional study, and follow-up emission monitoring events will be completed as described above. However, parallel ambient monitoring will also be completed in the near vicinity of the hot spot. Ambient samples will be collected at three locations, e.g., 10 to 100 m, downwind and upwind of the emissions monitoring location.

Expected Results: The research proposed herein will be the most comprehensive study of volatile HAP emissions ever completed for municipal sewers. Expected results include: A large database associated with task 1 tracer studies. The database will be available in spreadsheet format, and will be beneficial for the evaluation of existing and future models. A rigorous evaluation of the naUTilus and CMBA models. If the models are proven to be acceptable emissions estimation tools, this effort will facilitate their use in other urban areas. An answer as to whether a significant fraction of volatile HAPs that are discharged to sewers are likely to be emitted prior to reaching a treatment facility. A well-defined methodology for identifying air toxic "hot spots" in municipal sewers. A state-of-the-art database associated with HAP emissions from sewers in a large urban area. An assessment of whether sewers are major sources of volatile HAP emissions in urban areas, and whether future regulations are warranted to assess or control such emissions. A final report to the USEPA. Several papers in peer-reviewed journals and conference proceedings. Incorporation of findings into a short course that is offered on a regular basis at The University of Texas at Austin.

Relevant Websites: A project-specific Web site will be developed after completion of Task 1, and will highlight project objectives, progress, and selective findings of particular relevance to practitioners. It also will include a list of conference and journal manuscripts and presentations associated with the project, and a separate list of related literature. Some of this information currently exists on Dr. Corsi's Web site at http://www.ce.utexas.edu/prof/corsi/).

Progress and Final Reports: 2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/496/report/2000

Type: STAR GRANT
Status: Project Period Concluded
Reports: 2000, 2001

The Tulsa Air and Water Quality Information System

EPA Grant Number: R827963
Title: The Tulsa Air and Water Quality Information System
Investigators: Hilary Kitz, Gaylon Pinc, William Potter, Rhonda Jeffries,
Institution: City of Tulsa , Indian Nations Council of Government , Oklahoma Department of Environmental Quality , U.S. Geological Survey , University of Tulsa
EPA Project Officer: Madalene Stevens
Project Period: February 1, 2000 through December 31, 2001
Project Amount: $500,000
Research Category: Environmental Monitoring for Public Access and Community Tracking (EMPACT)

Description:

The Tulsa Air and Water Quality Information System (TAWQIS) will provide accessible, useful air and water quality information for residents of Northeastern Oklahoma. Ozone and NOx data will be coordinated with meteorological data for informed decision-making about air quality mitigation strategies. TAWQIS will inform residents about both drinking and recreational water quality by coordinating data from municipal and national sources. The project will enhance informed public policy discussion about the future of local watersheds and the impact of waste from the poultry industry. The objectives will be enriched through extensive education programs based on the TAWQIS data.

Approach:

The Indian Nations Council of Governments (INCOG) will coordinate all data sources and operate a web site devoted to TAWQIS environmental information. An extensive educational and community awareness program will reach those who are not yet connected to the internet. Monitoring data will be integrated from the City of Tulsa, the Oklahoma Department of Environmental Quality (ODEQ), a local allergy clinic, the Tulsa Metropolitan Utility Authority (TMUA) and the U.S. Geological Survey (USGS). Public awareness programs using TAWQIS data will educate citizens participating in policy discussions concerning transportation, trash management, and air and water quality planning.

Air quality: Real-time reporting and mapping will be enhanced by the installation of new ozone and Noy monitors. Meteorological data will be combined with air quality information to improve forecasting of days with potentially high ozone. Graphic displays will correlate bioaerosol levels, air quality parameters and asthma patient lung functions as monitored by Airwatch participants in the Allergy Clinic of Tulsa project.

Water quality: The website will coordinate local and regional water reports to provide information about drinking water sources with historical trend analysis. Drinking water treatment will be explained to illustrate the effects of poultry waste run off. TAWQIS will provide lake and river information for recreational users.

Expected Results:

TAWQIS will provide comprehensive environmental data to improve the ability of community residents to make informed public policy and personal decisions. The user friendly, data management processing and delivery system will be the basis for the creation of a comprehensive resource management policy.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/582/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/582/report/2001

Type: STAR GRANT
Status: Project Period Concluded
Reports: 2000

Paso del Norte Environmental Monitor

EPA Grant Number: R827964
Title: Paso del Norte Environmental Monitor
Investigators: Charles Kooshian, Robert Gray, Salvador Gonzalez-Ayala
Institution: City of El Paso, TX , Instituto Municipal de Investigación y Planeación , University of Texas at El Paso
EPA Project Officer: Madalene Stevens
Project Period: January 1, 2000 through December 1, 2001
Project Amount: $494,935
Research Category: Environmental Monitoring for Public Access and Community Tracking (EMPACT)

Description:

This project is developing an Internet web site and associated community linkages to provide relevant-time air quality and local traffic and transit information, in English and Spanish, to the international communities of El Paso, Texas, Sunland Park, New Mexico and Ciudad Juarez, Chihuahua.

The objectives of the project are to: 1. promote coordination among the many agencies, institutions, organizations and broadcasters within the Paso Del Norte region that are working to improve air quality; 2. develop standards for sharing and displaying information to ensure it is understandable by the general public and decision-makers of the region; 3. establish a communications infrastructure that provides relevant-time exchange of and access to information; 4. develop and implement public outreach programs to improve local understanding of individual actions that can be taken to improve the quality of the environment; 5. broaden the choices of travel mode; 6. promote education of the future generations by developing opportunities for elementary and high school students to conduct research and become involved in activities that improve our environment; and 7. ensure transferability of final products to other regions and applications.

Approach:

Continuous air monitors throughout the international region currently measure ambient air concentrations of ozone, carbon monoxide and particulates. Relevant-time access to this information will be provided along with updates on local weather, current traffic conditions and international bridge crossing delays. 3D time-lapse visualization of critical air pollutant levels will be made available to the public through the Internet and broadcast media. Other media, such as phone hotlines or roadside signs will also be incorporated. A similar effort will be devoted to assembling traffic volumes and delays from existing detectors, which also will be processed and displayed in map form to depict current conditions. The relationship between vehicle travel and pollution will be shown along with suggestions for individual actions that can reduce mobile source pollution. The project would facilitate transit use by providing quick, easy-to-understand route planning assistance.

Expected Results:

A well-informed public, empowered by this knowledge, may modify travel behavior to effect a reduction in pollutants. In addition, the international community will be brought together to identify and implement cost-effective solutions to local pollution, including increased education and involvement of future generations. This project will serve as an important prototype of the kind of cooperative international project necessary to address critical environmental challenges of the US/Mexico border region.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1002/report/2000

Type: STAR GRANT
Status: Ongoing
Reports: 2000, 2001

PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana

EPA Grant Number: R828009
Title: PULSES - The Importance of Pulsed Physical Events for Watershed Sustainability in Coastal Louisiana
Investigators: John Day, Jaye Cable, Dubravko Justic, Brian Fry, Paul Kemp, Enrique Reyes, Paul Templet, Robert Twilley
Institution: Louisiana State University - Baton Rouge , University of Southwestern Louisiana
EPA Project Officer: Bill Stelz
Project Period: February 28, 2000 through February 27, 2003
Project Amount: $899,995
Research Category: Water and Watersheds

Description:

Riverine inputs to floodplains, marshes and coastal wetlands are important to long-term ecological productivity and development of watershed resources. In many cases, including much of the Mississippi River drainage basin and delta, levees and dams constructed during the past 100 years have effectively isolated rivers from their natural connections to adjacent floodplain and deltaic wetlands. To help revitalize these productive systems, ecological restoration of historical river-floodplain connections is being attempted. This proposal focuses on evaluating effects of river inputs in one such coastal watershed, the Caernarvon watershed, just south of New Orleans, where river inputs have been ongoing since the 1991 opening of a gated river diversion structure, but have received little scientific attention and study.

Physical science objectives are to evaluate marsh accretionary responses to two different levels of river inputs or diversions, a low input rate (lx = 14m/s) and a high input rate (8x = I 12m3/s). The diversions will be experimentally conducted in two-week episodes as part of the normal operating schedule of the Caernarvon structure, controlled by the Louisiana Department of Natural Resources. In addition to the experimental diversions which will each be replicated four times over the two year field period, historical studies will evaluate effects of a great 1927 flood event at this site (ca. 650x river input) when levees were dynamited for flood relief.

Ecological science objectives air to evaluate marsh plant growth responses to river inputs that bring both sediments and relatively high levels of fertilizing nutrients. Nitrogen nutrient removal via denitrification and burial in wetland soils will be tested in response to soil flooding driven by tropical storms and normal tides as well as by the experimental river diversion inputs. Phytoplankton production and possible eutrophication will be monitored as part of the ecological work, and stable isotope studies will assay effects of river inputs on bass, shrimp and oysters that are the basis of important recreational and commercial fisheries of this area.

Social science objectives aim at providing an interface between the natural and human systems of the region, attempting to place human decision-making in the context of sustainable ecological development for this coastal watershed. Three types of modeling efforts will be employed to make linkages between the human and natural systems more, understandable: landscape simulation modeling, cost/benefit economic analysis, and multicriteria analysis.

Approach:

Our approach is to mount a coordinated, multi-investigator field program to meet physical and ecological science objectives, with each scientific component based on off-the-shelf technology. The emphasis is on evaluating a combination of experimental treatments (high and low input diversions) as well as taking advantage of storms and tides to document effects of physical pulsing on the overall ecosystem dynamics of this area. Human reactions to natural pulsing (flooding) are usually negative, and the various modeling interfaces we propose will help explore, minimizing negative effects while maximizing positive effects of natural flood events.

Expected Results:

The principal benefits of this holistic watershed project are: 1) an improved understanding of marsh accretion important for the sustenance of the coastal platform; 2) tests of eutrophication effects under different marsh flooding scenarios; 3) tests of the connectivity between fisheries and riverine inputs; and finally 4) an evolving educational process involving scientists, managers, stakeholders and schoolchildren in trying to best implement river-floodplain restoration for sustainable maintenance of a wealth-generating coastal zone.

Relevant Websites:

http://130.39.20.51/pulses/pulses.html
http://www.ucs.louisiana.edu/~rrt4630/pulses.html

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/795/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/795/report/2001

Type: STAR GRANT
Status: Ongoing
Reports: 2000, 2001

Infectivity and Virulence of *Cryptosporidium* Genotype H Oocysts in Healthy Adult Volunteers

EPA Grant Number: R828035
Title: Infectivity and Virulence of *Cryptosporidium* Genotype H Oocysts in Healthy Adult Volunteers
Investigators: Cynthia L. Chappell, Saul Tzipori, Pablo C. Okhuysen, Giovanni Widmer
Institution: University of Texas Health Science Center-Houston
EPA Project Officer: Cynthia Nolt-Helms
Project Period: March 1, 2000 through March 1, 2003
Project Amount: $503,884
Research Category: Drinking Water - Disinfection Byproducts

Description:

Cryptosporidium parvum is now recognized to be made up of a genetically heterogeneous population of organisms, which can be divided into those infecting humans (genotype 1/H) and those which are transmitted between human and animal hosts (genotype 2/C). Recent studies have shown that stable genotype 1/H isolates can be maintained in gnotobiotic (GNB) pigs. This significant advance will make studies of these isolates possible in human hosts. Experimental cryptosporidiosis in healthy adults has previously revealed variability in infectivity, outcome, and the immune response to geographically-diverse genotype 1/C isolates. Further, a comparison of serologically negative versus serologically positive individuals showed a significant increase in the ID50 in those with pre-existing serum IgG. These antibody positive individuals excreted many fold fewer oocysts than the antibody negatives, suggesting that secondary infections would be less likely to occur with this population. Although, the pre-sensitized volunteers were relatively resistant to low level exposures, high oocyst concentrations resulted in infection and diarrheal illness in a number of the volunteers. Indeed, some illness measures indicated that the diarrhea in antibody positives was more severe than in the antibody negatives.
The proposed experiments will extend these studies to two genotype 1/H isolates. Specifically, the study can be divided into three parts: 1) establish the infectious dose (ID50), clinical outcomes and intensity of infection for two *Cryptosporidium* genotype 1/H isolates in seronegative individuals; 2) investigate the antibody and cellular responses in volunteers to genotype 1/H isolates; and 3) identify parasite genotype-specific differences and the stability of DNA markers prior to and after passage in pigs and humans.

Approach:

Two stable genotype H (genotype 1) isolates from HIV-negative donors will be identified and amplified in a gnotobiotic pig and/or a IFN gamma knock out mouse model. Pre- and post-amplified oocysts (in pigs and volunteers) will be analyzed to document genotype stability. The dose response studies will be carried out in healthy adult volunteers. Each volunteer will be given a single oocyst dose and followed for 6 weeks. Clinical signs and symptoms will be documented, and fecal oocysts will be quantitated. Blood and saliva will be collected at specific time points for immunological studies. Endoscopic biopsies will be collected before and after challenge in those who wish to participate in this part of the study. The antibody and cellular responses in peripheral blood will be examined at various time points using crude oocyst extracts and recombinant proteins. New genetic probes will seek to identify parasite factors indicative of differences in volunteer infectivity (if different ID50's are found).

Expected Results:

Documenting the outcomes of infection with the 1/H genotype isolates will significantly advance the understanding of community acquired cryptosporidiosis and allow the development of more accurate risk assessment models. Comparison of the two genotype 1/H isolates will provide evidence for potential variations in virulence characteristics, a phenomenon seen in genotype 2/C isolates. Antibody and cellular studies will examine the immune response to exposure and/or infection and provide samples for study of the degree of cross-reactivity between antigens from the two genotypes. These studies will be important in understanding *Cryptosporidium* infection in the community and will have significant implications for water quality assessments.

Progress and Final Reports:

2000 Progress Report available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/821/report/2000

2001 Progress Report available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/821/report/2001

Type: STAR GRANT
Status: Project Period Concluded
Reports: 2000, 2001

Prevalence and Distribution of Genotypes of *Cryptosporidium Parvum* in Feedlot in the Western United States

EPA Grant Number: R828038
Title: Prevalence and Distribution of Genotypes of *Cryptosporidium Parvum* in Feedlot in the Western United States
Investigators: Edward R. Atwill, Bruce Hoar, William M. Sischo, C. Elmi, B. J. McCluskey, W. P. Epperson, D. M. Grotelueschen
Institution: University of California - Davis , South Dakota State University , University of Nebraska at Lincoln
EPA Project Officer: Cynthia Nolt-Helms
Project Period: April 1, 2000 through March 31, 2002
Project Amount: $248,461
Research Category: Drinking Water - Disinfection Byproducts

Description: The overall goal of the proposed research is to determine the prevalence of fecal shedding, distribution of genotypes, and associated risk factors for *Cryptosporidium parvum* (*C. parvum*) infection in populations of feedlot cattle in the United States. Infection with *C. parvum* in calves raised on commercial dairy farms is quite common. Cumulative incidence of infection often exceeds 90% within the first 30 days of life and as many as 107 oocysts/g may be shed in the feces of infected calves. In contrast, relatively little is known regarding the prevalence and intensity of fecal shedding of *C. parvum* in feedlot cattle. Although the older age of feedlot cattle suggests that *C. parvum* shedding will be of low intensity, these confined animal feeding operations (CAFO's) are comprised of cattle from a wide variety of geographical locations, animals which may be under varying levels of physiological stress and which are fed variable levels of grain which may collectively enhance the shedding of this zoonotic parasite. Recent evidence indicates that there are distinct genotypes of *C. parvum* which may differ in infectivity and virulence for humans and other mammalian hosts. Potential strain or genotype differences of *C. parvum* within populations of feedlot cattle may exist. To address these animal and human health issues and to develop strategies for minimizing environmental contamination of *C. parvum* from feedlot cattle, our project has the following objectives: Determine the prevalence and concentration of *C. parvum* oocysts in fecal samples from feedlot cattle in the United States. This will allow us to determine the significance of feedlot cattle as an environmental source of oocysts and to begin to calculate valid loading equations for the rate at which feedlot operations produce *C. parvum* oocysts. Determine the distribution of genotypes of *C. parvum* actively shed by feedlot cattle. This objective is designed to determine which genotypes of *C. parvum* are present in United States feedlot cattle. We will determine how genotypes are spatially distributed and whether geographic origin is predictive of genotype. Determine animal and pen-level management factors associated with a fecal sample testing positive for specific genotypes of *C. parvum*. This objective is designed to identify feedlot management practices which will minimize water quality and public health impacts from CAFO's and provide critical input for Comprehensive Nutrient Management Plans targeted for this segment of the cattle industry.

Approach: We will conduct a cross-sectional survey of feedlot cattle from at least 5 states, including but not limited to California, Colorado, Nebraska, South Dakota, and Washington. Within each state, 3 to 6 feedlots will be identified by cooperating researchers for voluntary inclusion in the study. For each feedlot, 4 pens will be selected for the study, with 65 fecal samples randomly collected from each pen, or 260 samples per feedlot. A standardized questionnaire will be administered for each pen. This sampling design will provide us with a diverse sample of management styles and animal types to examine potential risk factors associated with a fecal sample testing positive for *C. parvum*. Given that cattle arrive at feedlots from sources throughout North America, our sampling strategy is likely to collect samples from cattle from the majority of states within the continental U.S., as well as Canada and Mexico.

Fecal samples will be tested for presence of oocysts using a direct immunofluorescent assay. Mixed-effects logistic regression will be used to determine the significance and strength of association between potential risk factors and the probability of testing positive for *C. parvum*. We will evaluate four probability distributions (binomial, poisson, negative binomial, betabinomial) for modeling the sensitivity of our diagnostic assay. Based on the most appropriate model for assay sensitivity and the prevalence estimates from our multi-state cross-sectional survey, we will generate a set of equations which predict the loading rate of *C. parvum* oocysts per Kg of fecal material as a function of feedlot management practices. We will target two unlinked polymorphic loci for PCR-RFLP genotyping, *Cryptosporidium* oocyst wall protein and the SSU rRNA gene, with confirmatory DNA sequencing of the amplicons on a subset of isolates.

Expected Results: This study will provide valid and precise information on the prevalence and concentration of genotype-specific *C. parvum* oocysts being shed by cattle located in feedlots throughout the United States. We will be able to ascertain predominant genotypes of *C. parvum* and whether there are important regional differences in the prevalence and concentration of C. parvum genotypes isolated from feedlot cattle. Such data can be used to directly improve risk assessment calculations regarding the environmental loading rate of *C. parvum* genotypes from feedlot operations. Furthermore, since we will be conducting risk factor analyses which will identify feedlot management practices which protect the cattle from active infection, such information can help form the basis of good management practices and assist in the development of Comprehensive Nutrient Management Plans for this segment of the cattle industry. In this manner we will improve existing risk management strategies for minimizing water quality impacts from confined animal feeding operations.

Progress and Final Reports:
2000: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/822/report/2000
2001: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/822/report/2001

Type: STAR GRANT
Status: Ongoing
Reports: 2000

An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin

EPA Grant Number: R828070
Title: An Integrated GIS Framework for Water Reallocation and Decision Making in the Upper Rio Grande Basin
Investigators: Olen Paul Matthews, David S. Brookshire, Michael E. Campana, Louis A. Scuderi, Brad T. Cullen, Kirk Gregory, Seth Snell, Janie Chermak, Kate Krause
Institution: University of New Mexico
EPA Project Officer: Bill Stelz
Project Period: March 1, 2000 through February 28, 2003
Project Amount: $409,977
Research Category: Water and Watersheds

Description:

We purpose to use a coupled physical, environmental, and human system model in an integrated Geographic Information System (GIS) framework to simulate interactions and changes within the Rio Grande watershed in NM. The coupled model proposed will operate entirely within a GIS unlike other models that use GIS mostly for display. This approach will permit the evaluation of impacts if any component of the model changes as a result of natural or anthropogenic causes. Because water law and economics will be integrated with physical and biological components, the coupled model can be used to evaluate the economic consequences of different environmental policies. Stakeholders will use the model to evaluate policy questions.

Approach:

The project has two aspects: development of the GIS model and stakeholder evaluation of policy options. The modeling framework of this study utilizes a raster based distributed water balance approach in which each raster element represents a bucket through which inputs and outputs may be routed. The model utilizes a hierarchical resolution grid scheme based on a quad-tree subdivision of the landscape. The raster data structure is designed to allow an infinite number of process specific resolutions on an as-needed basis (i.e., finer cells where detail is required, coarser cells where data limitations preclude the finer scales or where processes operate on coarser scales). Stakeholders will participate in focus groups to discuss issues and create future water use scenarios. The information gained during these early stages will be, to a large extent, hypothetical. We will then develop a pseudo-real time decision analysis tool that incorporates real consequences, via monetary payoffs, minimize the potential bias in hypothetical responses. Stakeholders will make water use decisions in an experimental setting. The cumulative effects of individual stakeholder decisions will be simulated using a GIS model developed in the first two years of this research.

Expected Results:

Because citizens and managers are uncertain how reallocation will impact individual water users, the public, or the environment, resistance to change is common. The proposed model creates a realistic framework that will allow the volume of water to be determined at any place and point of time within the watershed being modeled. Coupled with disparate representation and economic activities, the model will be used to determine the impact and tradeoffs between different management and policy decisions. By having stakeholders identify the issues, a more realistic evaluation is possible.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/827/report/2000

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Forming Carbon-Carbon Bonds in Water and Other Alternative Media

Grant Number: R828129
Title: Forming Carbon-Carbon Bonds in Water and Other Alternative Media
Investigators: Chao-Jun Li
Institution: Tulane University of Louisiana
EPA Project Officer: Barbara Karn
Project Period: June 1, 2000 through May 31, 2003
Project Amount: $310,000
Research Category: Technology for a Sustainable Environment

Description:

The long term objective of the proposed research is to develop various environmentally friendly chemical syntheses using water, liquid CO2, and ionic liquid as non-polluting solvents. Approach: Metal-mediated carbon-carbon bond formation is one of the most important fundamental reactions in organic chemistry and is widely used in various chemical and pharmaceutical processes. Traditionally, they are carried out in anhydrous organic solvents and are air-sensitive and are potentially explosive. The present study investigates the scope, mechanism and synthetic application of metal-mediated reactions through the use of water solvents. The synthesis of various biologically important compounds and fine chemicals are to be investigated through the aqueous method. The method saves synthetic steps by avoiding many protection and deprotection processes and contributes to overall synthetic efficiency and a reduction in organic emission. Additional research is planned to transform the reaction into a catalytic process. Additionally, the use of liquid CO2 and ionic liquid as non-polluting solvents for carbon-carbon bond formations will also be investigated.

The present study would establish the foundation of developing the aqueous metal-mediated reaction into a general process that does not use anhydrous organic solvents, avoids the use of protection-deprotections, is applicable to large scale industry operation, and has a reduced impact on environment due to the use of catalytic amount of metal and/or in-process recycling. The present project also provides basic understandings of using liquid CO2 and ionic liquids for carbon-carbon bond formations.

Expected Results:

Chemical technologies developed herein will significantly enhance the efficiency of chemical synthesis and reduce the amount of organic waste in reactions and product isolations by saving synthetic steps due to the elimination of many functional group protection/deprotection steps. All these alternative solvents can be readily purified and recycled for further reactions which further prevent the discharge of chemical wastes.

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Homogeneous Catalysis in Supercritical Carbon Dioxide with Fluoroacrylate Copolymer Supported Catalysts

Grant Number: R828135
Title: Homogeneous Catalysis in Supercritical Carbon Dioxide with Fluoroacrylate Copolymer Supported Catalysts
Investigators: Aydin Akgerman, John P. Fackler Jr
Institution: Texas A & M University , Texas Engineering Experiment Station
EPA Project Officer: Barbara Karn
Project Period: June 1, 2000 through May 31, 2003
Project Amount: $315,000
Research Category: Technology for a Sustainable Environment

Description:

Chemistry in ecologically benign solvents is of increasing interest in "Green Chemistry", catalysis and combinatorial chemistry. Most solvents used in organic syntheses with homogeneous catalysts are coming under close scrutiny because of their toxicity. There is a great push in industry today to replace these solvents with environmentally benign solvents such as supercritical carbon dioxide, scCO2, but most catalysts are not soluble in scCO2 and some organic syntheses are solvent selective. Another major problem is the separation and recovery of the catalyst after the reaction, which results in catalyst loss and metal contamination. A major thrust in industry is to develop homogeneous catalysts which can be recovered easily and intact after the completion of the reaction. In this vain, there is a significant amount of interest in polymer supported ligands for metal complexation in homogeneous catalysis. In this project we propose to evaluate a novel idea that solves both the solvent replacement and intact recovery of catalyst issues. We plan to attach the catalyst ligands to a fluoroacrylate copolymer, which is soluble in scCO2. In addition, the polymer can easily be separated by a membrane. In the overall process, the membrane separation of the reactor effluent will maintain the catalyst in the reactor. The products can be separated from scCO2 by simple expansion yielding solvent free products. CO2 can be recompressed and recycled, if needed. Upon completion of the reaction and expansion of the scCO2 remaining in the reactor, the catalyst will also be obtained intact.

Approach:

Our approach will be in five phases. (1) We will first synthesize functionalized copolymers using commercially available fluoroacrylates and an active ester comonomer, specifically N-acryloxysuccinimide (NASI), the former enabling solubility in carbon dioxide the latter providing an exchange site for an active catalyst. (2) The NASI group on the copolymer would easily react with amine containing complexing agents. We will then exchange the NASI branches for metal ion containing catalytic materials for hydrogenation and hydroformylation reactions. (3) We will determine solubilities of these catalytic materials in scCO2 at a range of temperatures and pressures. (4) We will evaluate the catalytic activity of these new novel catalysts in hydrogenation and hydroformylation reactions carried in scCO2; and (5) We will evaluate membrane reactors for catalyst separation and recovery.

Expected Results:

We have already synthesized the polymer with the NASI group replaced by a catalyst precursor and a diazo dye which gives the polymer a red color. We have shown that these products are soluble in scCO2 and dye substituted polymer gives a orange/yellow colored solution. In order to evaluate whether the dye is active, we dissolved the polymer in scCO2 in the presence of an organic base, diethylamine. The azo dye, in a basic solution, would have a yellow color, and we observed that the color does indeed change to yellow from orange/yellow. Hence we have qualitatively shown that the polymer/catalyst is soluble in carbon dioxide and that the functionalized sites are exposed in solution and are available for reaction. Based on this proof-of-concept, we are confident that catalyst supported will be soluble in supercritical carbon dioxide and will also be active as a catalyst.

Estimated Improvement in Risk Assessment: This project aims and reduction in use of toxic solvents and also reduction in metal contamination. Supercritical carbon dioxide can be as good a reaction medium as many organic solvents for many reactions, hence there will be a reduction in use of solvents. Secondly, when reactions are carried in supercritical carbon dioxide, after expansion the products are obtained solvent free, which is an additional advantage eliminated solvent contamination of the products. Finally, the catalyst will also be obtained intact in the proposed system, eliminating loss of heavy metals and the need for re-synthesis.

Type: STAR GRANT
Status: Project Period Concluded
Reports: 2000

Biosensors for Field Monitoring of Organophosphate Pesticides

EPA Grant Number: R828160
Title: Biosensors for Field Monitoring of Organophosphate Pesticides
Investigators: Ashok Mulchandani, Wilfred Chen, Joseph Wang
Institution: New Mexico State University - Main Campus , University of California - Riverside
EPA Project Officer: S. Bala Krishnan
Project Period: June 1, 2000 through May 31, 2002
Project Amount: $227,169
Research Category: Environmental Engineering

Description:

The lack of sensors to perform discrete and real-time in-situ measurement/detection of organophosphates (OPs) in the field has limited the ability to routinely monitor these highly neurotoxic but widely used pesticides/insecticides. The overall objective of this research is to develop, optimize, characterize and validate biosensors for rapid, selective, sensitive, precise, accurate, simple and low-cost discrete and real-time in-situ monitoring of OPs in the field. The biosensors will be based on screen-printed electrodes (SPE), constructed using thick-film screen printing technology, modified with Escherichia coli cells displaying organophosphorus hydrolase (OPH) on the cell surface alone and together with pNP-monooxygenase. OPH catalyzes the hydrolysis of paraoxon, parathion, methyl parathion, fenitrothion, EPN, etc., at high rate and selectively to p-nitrophenol (pNP), which will be detected directly at the SPE or converted to hydroquinone by pNP-monooxygenase and detected at SPE. Additionally, the biosensors will be coupled with micromachined electrophoresis chips for selective determination of different OPs in a mixture and real-time in-situ measurement.

Approach:

Preliminary work in our research laboratory has demonstrated the potential of combining the biosensing capability of OPH-modified SPE for sensitive, selective, rapid, precise, accurate and low-cost field monitoring of OPs. Experiments will be conducted to: (1) Optimize the fabrication conditions -- type of ink, ink additives, curing temperature and time -- optimize method and condition of cell (E. coli displaying OPH on the cell surface) immobilization and operating conditions-- operating potential, weight of cells immobilized, buffer ionic strength and pH, organic solvent type and concentration and temperature--for the determination of OPs. (2)

Evaluate the effect of pNP-monooxygenase incorporation with E. coli displaying OPH on cell surface in the SPE on the operating potential and optimize the operating conditions for the new biosensor. (3) Determine the sensitivity, linearity, detection limit, selectivity (for OPs such as paraoxon, parathion, methyl-parathion, EPN, fenitrothion, etc., that produce pNP when hydrolyzed) and life-times (shelf-storage and operational) of the biosensors. (4) Critically evaluate and validate the new biosensors for monitoring OPs by investigating the precision and accuracy (comparing the biosensor measurement to the EPA standard method for pesticide analysis) on simulated and real samples. (5) Optimize operating parameters of the coupled SPE biosensors - micromachined electrophoresis chip for selective determination of individual OP in a mixture, and evaluate and validate the microsystem. (6) Adapt, evaluate and validate the microsystem of SPE biosensors for real-time in-situ OP monitoring.

Expected Results:

The combining of the attractive biocatalytic actions of OPH (selective and fast hydrolysis) and pNP monooxygenase (conversion to hydroquinone) with SPEs (sensitive, low-cost, reproducible mass production and portable) and electrophoretic separation on a micromachined electrophoresis chip will result in the development of a simple, sensitive, selective, fast and low-cost analytical tool for OPs suitable for discrete and real-time in-situ field monitoring needs.

Progress and Final Reports:

2000 Progress Report available at:

http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/363/report/2000

Type: STAR GRANT
Status: Completed
Reports: 2000, Final

Oxidative Transformation of Model Oxygenated Hazardous Air Pollutants

EPA Grant Number: R828175
Title: Oxidative Transformation of Model Oxygenated Hazardous Air Pollutants
Investigators: Philip H. Taylor, Paul Marshall
Institution: University of Dayton
EPA Project Officer: Paul Shapiro
Project Period: July 20, 2000 through July 19, 2002
Project Amount: $215,900
Research Category: Exploratory Research - Environmental Chemistry

Description:

Reaction with hydroxyl (OH) radicals is an important step in the oxidation of organic compounds in the atmosphere and in combustion systems. Formaldehyde (CH2O) and acetaldehyde (CH3CHO) are hazardous air pollutants (HAPs) regulated under Title III of the Clean Air Act Amendments. The overall goal of this research is to determine the rates and mechanisms of OH reactions with representative oxygenated hazardous air pollutants, i.e., formaldehyde, acetaldehyde, and acetone, under conditions that are representative of both atmospheric and combustion conditions. The kinetic and mechanistic studies will be used to validate comprehensive theoretical studies of these reactions.

Approach:

We propose to combine two existing techniques to study the kinetics and mechanism of the reaction of OH radicals with formaldehyde, acetaldehyde, and acetone over an extended temperature and pressure range. A refined pulsed laser photolysis/laser-induced fluorescence (PLP/LIF) technique will be used for the kinetic measurements. A recently developed pulsed laser photolysis/photo-ionization mass spectrometry (PLP/PIMS) technique will be used to obtain quantitative product data. In the absence of reactant thermal decomposition, accurate rate constant measurements and mechanistic data obtained by these combined techniques will span a temperature range from room temperature to ~1000 K and a pressure range of ~10 torr to ~740 torr. In addition to the detailed experimental plan, a thorough theoretical study is proposed through collaboration with Prof. Paul Marshall of the University of North Texas. Reaction pathways will be characterized by ab initio methods, at up to the Gaussian 2 and 3 levels of theory, and will be analyzed using variational transition state theory.

Expected Results:

The proposed research will be a valuable input to risk assessment models concerned with the transformation of these HAPs. This study will identify key gas-phase pathways for their destruction under both atmospheric and higher temperature combustion conditions. These pathways will be important contributions to comprehensive gas-phase models of the atmospheric transformation of these HAPs and the high-temperature destruction of conventional hydrocarbon fuels and alternative oxygenated fuels. The fundamental data and models developed in this study will also contribute to the infrastructure of knowledge of the combustion of hydrocarbon fuels and their impact on the environment.

Progress and Final Reports:

2000 Progress Report at
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/831/report/2000

Final Report at
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/831/report/F

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Toward the Development of a Detailed Mechanism of Transition Metal Catalyzed Formation of PCDD/F from Combustion Generated Hydrocarbons

EPA Grant Number: R828191
Title: Toward the Development of a Detailed Mechanism of Transition Metal Catalyzed Formation of PCDD/F from Combustion Generated Hydrocarbons
Investigators: Barry Dellinger
Institution: Louisiana State University - Baton Rouge
EPA Project Officer: Paul Shapiro
Project Period: July 1, 2000 through June 30, 2003
Project Amount: $345,000
Research Category: Combustion Emissions

Description:

The formation of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F or "diox:ns" for short) in combustion sources is one of our most pressing environmental issues. Field studies strongly suggest that they are formed in the post-combustion, cool-zone of combustors by surface-mediated/catalyzed pathways. Laboratory studies have demonstrated that some transition metals, incorporated into silica-based fly ash, can catalyze dioxin formation in the 250 to 500 C range. However, the exact mechanism has not been determined. We propose to investigate the following hypothesized (and partially demonstrated) mechanism: 1) metal-catalyzed chlorination of C-olefins; 2) metal-catalyzed molecular growth and aromatization of the resulting chlorocarbons; and 3) surface mediated condensation of chlorinated benzenes to form PCDD/F. We have previously demonstrated that chlorination and aromatization occur on silica-Cu (II) surfaces, that chlorobenzenes chemisorb on silica surfaces, and that PCDD/F congener distributions are formed that are consistent with those observed for full-scale incinerators. We now propose to investigate the applicability of our theorized mechanism of aromatization of CHCs to other surfaces and determine the additional surface mediated reactions that occur in their conversion to PCDD/F.

Approach:

We will examine the previously observed products of metal catalyzed chlorination of acetylene: trichloroethylene, tetrachloroethylene, and dichloroacetylene. We will investigate their reactions on Fe (111) and Cu (II) doped silica and alumina surfaces. The study will be performed using a gas-solid reactor, coupled to a GC-MS, that permits controlled study of the heterogeneous reactions of these compounds on various surfaces at temperatures from 150 to 600 C. We will utilize isotopically-labeled chlorine compounds to attempt to verify our proposed mechanism that involves carbon-to-transition metal chlorine transfer in key steps. Surface adsorbed products, including PCDD/F and chlorinated phenols, will be analyzed using conventional soxhlet extraction and clean-up procedures followed by GC-MS analysis. Advanced surface analysis techniques including XANES, EXAFS, XPS, IR and Raman will be used to characterize valence state and chemical species of the iron and copper. Homogeneous reaction studies of model compounds for the proposed organo-silicon and organo-copper intermediates will be performed to further elucidate the mechanism of dioxin formation.

Expected Results:

If successful, we will have, for the first time, demonstrated a detailed mechanism of formation of PCDD/F from ubiquitous, combustion generated hydrocarbons. It appears that mechanisms similar to those responsible for dioxin formation are also responsible for combustion emissions of other halogenated hydrocarbons (HHCs) and endocrine disrupting chemicals (EDCs). The development of a unified mechanism and understanding of formation of halogenated combustion by-products will greatly facilitate the development of improved risk management and assessment strategies.

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Development of Life Cycle Inventory Modules for Semiconductor Processing

EPA Grant Number: R828208
Title: Development of Life Cycle Inventory Modules for Semiconductor Processing
Investigators: Cynthia F. Murphy, David T. Allen
Institution: University of Texas at Austin
EPA Project Officer: Barbara Karn
Project Period: April 1, 2000 through March 31, 2003
Project Amount: $325,000
Research Category: Technology for a Sustainable Environment

Description:

The primary objective of the proposed project is to develop generic, use cluster, life cycle inventory (LCI) modules for activities performed during the manufacture of integrated circuits (ICs). This research is intended to facilitate the establishment of standards, encourage the development of predictive rather than historical life cycle analyses, and potentially simplify communication along the materials/product supply chain. The creation of generic rather than product/process specific modules is intended to focus the effort on the gathering and analysis of data that are relatively independent of time and space (i.e., data that will not become obsolete as technology changes are made and which may be applied to multiple manufacturing sites). This will foster standardization and encourage use of the modules by the industry in general rather than by a single company. Generic modules are also less likely to contain sensitive or proprietary manufacturing information and may decrease concerns about sharing of confidential information along the supply chain.

Approach:

The proposed research will lay the groundwork and develop methodologies for gathering and analyzing data in the area of environmental merit. The intent is to begin the process of capturing and analyzing LCI data such a way that it is immediately useful, while at the same time has extendability across the industry, along supply chain lines, and into the future technologies. A high-level approach will be used to overcome some of the extreme complexity and time barriers that have historically associated with similar efforts. Motorola and SEMATECH, both in Austin, Texas, have agreed to work with the University of Texas to provide technical guidance to the team and permit access to data and process areas as appropriate in the execution of this project.

The general approach to the project will be to create an initial set of use cluster modules and associated LCI modules. The modules will be populated with actual data and validated in a manufacturing setting. Inputs will be described as parametric distributions and sensitivity analyses will be performed using Monte Carlo simulation. The team will then down-select to a small number of use clusters of particular concern or interest. Additional predictive LCI module options, which represent future technologies will be developed for these down-selected modules. These predictive modules will be populated with postulated data and sensitivity analyses will be generated. The results of the predictive LCI modules will be shared with a number of industry representatives. Feedback from these representatives will be incorporated as appropriate.

Expected Results:

The set of predictive, generic LCI modules will be disseminated through a significant portion of the semiconductor industry through SEMATECH. Companies that adopt this methodology may use the existing LCI modules and generate additional ones internally to communicate more effectively with their suppliers and with their customers. This is expected to in part satisfy the increasing demand for this type of information along the supply chain and to better meet the needs of the customer. It also provides the basis for a system of standardization so that IC manufacturers are not required to perform separate tests for each customer. While the initial assumptions will be based on current costs, infrastructure, and technology, using metrics that are as independent as possible from specific products and processes will allow these LCI modules to be used widely and for an extended period of time. As the set of assumptions changes, the general methodology can be used to develop new modules.

The training and support of two graduate students will provide them with exposure to the semiconductor industry, a major employer of engineers with advanced degrees in engineering. This level of exposure to the semiconductor manufacturing and its practices is a rare opportunity. The professional contacts the students make will be invaluable to their future careers whether they work in academia or industry.

Expected Improvements to Risk Management: The semiconductor industry can use the life cycle inventory data generated by this project in conjunction with publicly available impact data to identify areas of potential improvement for current processes. The resulting impact assessments can be used to predict, and therefore avoid, negative impacts associated with future processes and/or technologies.

Type: STAR GRANT
Status: Ongoing
Reports: 2000

New Sensor Technology for Reducing Emissions from Automobiles

EPA Grant Number: R828209
Title: New Sensor Technology for Reducing Emissions from Automobiles
Investigators: Henry F. Taylor
Institution: Texas A & M University
EPA Project Officer: Barbara Karn
Project Period: May 1, 2000 through April 30, 2003
Project Amount: $220,000
Research Category: Technology for a Sustainable Environment

Description:

The goal of this project is to carry out experimental research which promotes the utilization of a new fiber optic sensor technology for reducing harmful emissions from automobile engines. The sensors will measure in-cylinder gas pressure, the key input for engine control systems designed to minimize emissions under all operating conditions. The transducer element is the fiber Fabry-Perot interferometer (FFPI), which was developed at Texas A&M and has been commercialized by a small company, Fiber Dynamics, beginning in 1994. The company produces in-cylinder pressure sensors for large industrial engines, such as those used in natural gas transmission.

At present, the sensor commercialization effort at Fiber Dynamics is complemented by ongoing fiber optics research at Texas A&M - research exemplified by the proposed NSF/EPA project. The FFPI engine sensor has proven accurate and reliable during hundreds of thousands of hours of operation in the harsh engine environment, but a great deal of research and development is still needed before products meeting the demanding requirements of the automotive industry can evolve. The major technological barriers, which apply to both the transducers and the monitoring optoelectronic system, are perceived to be (1) cost, (2) size, and (3) speed of operation. The proposed project will explore means for overcoming each of these barriers, as a first step in convincing the automobile manufacturers and their suppliers that fiber optics is a strong candidate as the "missing link" in achieving more effective engine control.

Specific tasks will address the following component developments: (1) Low-cost, miniaturized pressure transducers. - Under the proposed project, methods for making spark-plug-embedded FFPI pressure sensors will be explored. Representing a radical departure from prior fiber optic transducer designs, this type of sensor has a chance to meet a cost goal of less than $5 per

cylinder while requiring very little space in the engine compartment; (2) Low-cost light source. - The feasibility of using vertical cavity surface-emitting lasers (VCSELs) in the optoelectronic system for monitoring the sensors will be explored. This type of laser, recently introduced as a light source for fiber optic communication networks, could be the key to achieving an inexpensive optoelectronic system for acquiring the sensor data; (3) High speed electronics. - Novel signal processor designs utilizing state-of-the-art microcontroller and digital signal processing chips will be explored as a means of increasing the sampling rate from the present 4 kHz to the 50 kHz - 100 kHz regime, as required for automotive application.
Industrial partners in the proposed project, Visteon Automotive Systems (an enterprise of Ford Motor Company), of Dearborn, MI, and Fiber Dynamics of Bryan, TX, will provide technical advice and assistance as well as the use of test facilities for evaluating the sensors produced at Texas A&M.

Expected Results:

The expected result of the project is a convincing demonstration that performance and cost barriers to applying fiber optic pressure sensors in engines can be overcome. A substantial reduction in air pollution will result from a more efficient use of the internal combustion power plant through effective closed-loop engine control.

Progress and Final Reports:

2000 Progress Report available at:

http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/26/report/2000

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Type: STAR GRANT
Status: Project Period Concluded
Reports: No Reports Available Yet

Wastewater Reuse and Zero Discharge Cycles in Process Plants

Grant Number: R828210
Title: Wastewater Reuse and Zero Discharge Cycles in Process Plants
Investigators: Miguel J. Bagajewicz, Mariano Savelski
Institution: **University of Oklahoma**
EPA Project Officer: Barbara Karn
Project Period: June 15, 2000 through June 14, 2001
Project Amount: $99,988
Research Category: Technology for a Sustainable Environment

Description: The purpose of this project is to continue the development of methodologies for the design and/or retrofit of environmentally benign water cycles in chemical and petrochemical processing units. This project is a continuation of EPA grant 825328010, which made several conceptual contributions. An industrial partner is participating in this new phase to prove these concepts and the new developments in practice. End-of-pipe treatment solutions for wastewater cleanup are being replaced by water recycle/reuse and decentralized cleanup systems. Since the first formulations of the problem, which are graphical in nature, there have been several investigators that have addressed this problem using a variety of tools. Some of the limitations of these tools are numerical, but other are conceptual.

Approach: The group at the University of Oklahoma has been able to provide several innovative solution procedures for these problems. First, necessary and sufficient conditions of optimality of these problems have been developed. These conditions enable the formulation of linear problems for the single component case and tree searching for multicomponent cases. In addition, forbidden and compulsory cases can be analyzed. The group has been able to develop a methodology to solve this problem globally by hand. Other work has also been accomplished. The interaction between heat integration and water allocation has been rigorously solved overcoming the limitations of other approaches. Finally, methods to perform optimal retrofit have been proposed. Notwithstanding the value of these advances and some of the contributions of other researchers, the problem continues to offer theoretical and practical challenges. The water allocation problem and the wastewater cleanup problem have to be properly merged in a single problem so that decentralized cleanup can be appropriately addressed. Even though good methodologies exist for the solution of both problems separately, the simplifying assumptions of the original work have to be revisited. In particular the issue of fixed load in water polluting processes and fixed removal in wastewater cleanup need reformulation. The mathematical properties of the problem are thus changed and new procedures need to be developed.

Procedures to reallocate water dynamically on the basis of existing process-t-o-process connections also need to be developed. The layout of a complex has important impact on the economics of reuse and has been ignored. The impact of mass exchange driving force on capital cost should be considered. Reactors have not been included and the interaction between heat and mass transfer has been ignored altogether. Mass exchanger network technology has not been fully exploited. Alternative locations of pollutant interception, via process modifications need to be developed. Finally, the ultimate goal of exploring solutions that enable zero discharge have not been properly discussed, much less solved. The concept of zero water discharge refers to closed circuits of water, such that water disposal is eliminated altogether. Closed circuits are appealing because end-of-pipe regeneration does not have to be conducted to the full extent required for disposal as water can be reused with higher level of contaminants. Additionally, the absence of a discharge eliminates internal administrative costs associated with the enforcement of EPA and local limits, as well as the interface with government agencies.

This project will be conducted primarily at the University of Oklahoma, as a continuation of the previous EPA grant. Phillips Petroleum is the Industrial partner. Dr. Savelski, who worked in this project for three years, will participate now as a co-PI at Rowan University. The methodology used to address the new posed challenges is the development of necessary conditions of optimum that can simplify the mathematical complexity of mathematical programming formulations, which are otherwise too cumbersome to solve. This project will have a significant impact on water usage and wastewater management for the chemical and petrochemical industry. It follows the guidelines of the DOE and NSF sponsored Workshops on these issues held in New Orleans (January 4-6, 1996) and the specific goals suggested by this program in the area of Engineering for Pollution Prevention. This technology is mature enough to be tested in sites. In addition, several conceptual contributions to the general engineering knowledge will be explored. Finally, the participation of undergraduates helps disseminating green process systems engineering concepts.

Expected Results: Specifically, this one-year project will address four of the many remaining challenges of this problem: *Development of methodologies to address the design of systems that contain processes for which some contaminants have either a fixed outlet concentration or a load that is a function of the outlet concentration.* Almost all the methods that have been developed consider fixed pollutant loads and maximum inlet/outlet concentrations. *Extension of the existing tree search methods developed by the group at the University of Oklahoma to the consideration of Decentralized treatment.* It is well known that these solutions reduce the fresh water consumption and discharge. *Extension of the existing tree search methods developed by the group at the University of Oklahoma to the consideration of uncertainty in data.* This has been the most important concern raised from practice. *Evaluation of Zero Discharge solutions.* Preliminary analysis will be performed using existing models to assess the potential economic impact if such cycles were to be adopted by industry. The expected results of this project are therefore improved methods to handle the design and retrofit of water utilization systems in process plants. In addition the economical impact of zero discharge cycles will be assessed. These methods will be tested using data provided by the industrial partner (Phillips Petroleum). By providing these solutions industry will be able to continue reducing water usage and discharge, thus reducing pollution.

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Fundamental Studies of Wood Interface Modification for Formaldehyde Pollution Avoidance and Prevention

EPA Grant Number: R828565
Title: Fundamental Studies of Wood Interface Modification for Formaldehyde Pollution Avoidance and Prevention
Investigators: John J. Meister
Institution: Forest Products Research Center
EPA Project Officer: Barbara Karn
Project Period: September 15, 2000 through September 14, 2003
Project Amount: $324,254
Research Category: Technology for a Sustainable Environment

Description:

This proposal supports fundamental studies of thermoplastics which tacify the wood interface, allow wood to wood binding to occur, and use no formaldehyde-based binder. The goal of the work is to develop a new, formaldehyde free binding system for wood.

Approach:

Most of the experiments of this research project will be based on an experimental design program. Experiments to make graft copolymer coupling agent will be based on previous experience in synthesizing these materials. Experiments to bind wood will be run in designed, statistically useful sets to determine how physical properties of the bound panels depend on the adhesive, its preparation process and chemical composition, its mode of application, and its concentration in the panel. Experimental design procedures will be used to relate number of grafts, molecular weights, grafting efficiency, weight percent backbone in the product, contact angle, critical surface tension, and coupling agent-polystyrene ratio to linear expansion, stability, panel and bond durability, tensile strength, panel shear modulus, compression strength, annealing time, use of different polystyrenes in the binder formulations, and application of the binder as a powder.

Expected Results:

Successful completion of this study will result in the development of a new binding system for wood panel formation that replaces formaldehyde-based binder with a thermoplastic binder and removes the major source of environmental exposure to formaldehyde. It will also produce technology to apply these binders and data on the effectiveness of the binders in connecting wood veneer, wood chips, or wood strands. These materials would be made from wood byproduct lignin, a major current waste product from our forests. The new chemistry for lignin modification and new binding process would remove formaldehyde while binding wood with a sustainable product produced from a waste of paper manufacture.

If a functional new binder for wood is developed, its widespread application would remove the major source of environmental exposure to formaldehyde for the population of the United States.

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Chinese Tallow Invasions into the Endangered Coastal Prairie: Causes and Consequences

EPA Grant Number: R828903
Title: Chinese Tallow Invasions into the Endangered Coastal Prairie: Causes and Consequences
Investigators: Evan Siemann, William Rogers, James Grace
Institution: Rice University
EPA Project Officer: Gina Perovich
Project Period: June 1, 2001 through May 31, 2004
Project Amount: $381,687
Research Category: Exploratory Research - Human Health

Description:

Chinese Tallow Tree (Sapium sebiferum) is a major invader in the southeast United States which aggressively displaces native plants. Our research will focus on the mechanisms that allow Tallow Tree to establish in endangered coastal prairies and transform them into biotically depauperate forests.

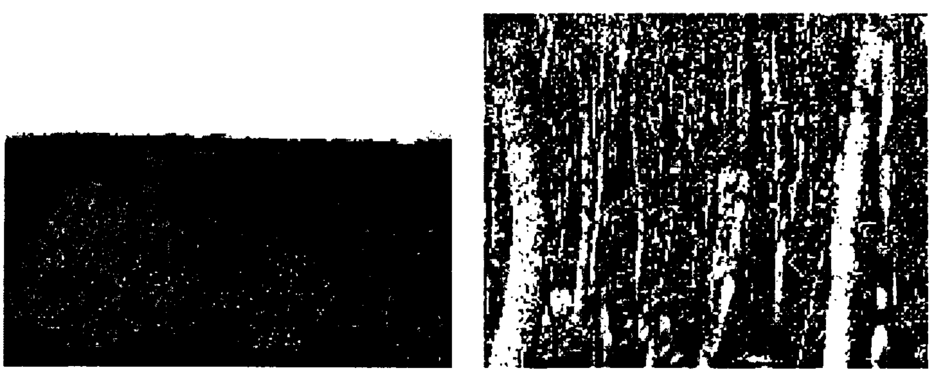
The main objective of this work is to understand how abiotic conditions interact with biotic factors to influence the likelihood, severity and impacts of Chinese Tallow Tree invasions into coastal prairie. Specifically, we will address the following questions: 1) How do fire (annual or periodic), soil fertility and herbivores interact to influence Tallow Tree invasion? 2) How do flooding, soil fertility and herbivores interact to influence Tallow Tree invasion? 3) How important is local recruitment limitation vs. local conditions in determining the likelihood and severity of Tallow Tree invasion?

Approach:

We will use four experiments in East Texas coastal prairie to address these questions. One pair of experiments will involve fire, fertilizations, Tallow Tree seed and seedling additions, manipulations of insect and vertebrate herbivores and measurements of Tallow Tree success and impacts. The other pair of experiments will involve flooding, fertilizations, Tallow Tree seed and seedling additions, manipulations of insect herbivores and measurements of Tallow Tree success and impacts. Because fire and flood mortality are strongly size dependent (with small saplings almost always killed and larger ones rarely affected), herbivores or fertility may interact with fire and flooding by changing Tallow Tree growth rates. Some of the data we will collect includes and flooding by changing Tallow Tree growth rates. Some of the data we will collect includes Tallow Tree seed germination and survival rates, Tallow Tree seedling survival and growth rates, diversity and composition of the prairie plant community, soil carbon and nitrogen and aboveground carbon and nitrogen.

Expected Results:

The experiments will provide results that address both basic and applied questions. Understanding the mechanisms of invasion is critically important to both society, with increasing economic and political impacts of alien species, and ecology because invasion plays a key role in community assembly and greatly influences ecosystem function. In addition to advancing basic scientific understanding, our research will inform management of Tallow Tree by providing information on its growth and survival in a number of environmental conditions at different life stages. Because Tallow Tree invasion shares many features with other alien plant invasions, our results should have broad applicability.



Coastal prairie kept free of Sapium by annual mowing (left). An adjacent area is a Sapium forest 25 years after mowing was stopped (right).

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

The Influence of Amphiphilic Molecules on the Environmental Fate and Transport of Pharmaceuticals

EPA Grant Number: R829005
Title: The Influence of Amphiphilic Molecules on the Environmental Fate and Transport of Pharmaceuticals
Investigators: Tohren C. G. Kibbey, David A. Sabatini
Institution: University of Oklahoma
School of Civil Engineering and Environmental Science
Norman, OK
EPA Project Officer: Angela Page
Project Period: September 1, 2001 through August 31, 2004
Project Amount: $316,600
Research Category: Drinking Water - Disinfection Byproducts

Description:

Thousands of tons of pharmaceuticals are produced annually for human and animal use, and significant quantities ultimately find their way into the environment. A wide range of pharmaceuticals have been identified in the environment, including antibiotics, analgesics, psychiatric drugs, and natural and synthetic hormones. Human pharmaceuticals enter the environment through incomplete wastewater treatment of drugs either not absorbed by the body or intentionally discarded down the drain. Pharmaceuticals in animal wastes enter the environment directly though infiltration into groundwater or runoff into surface waters. Although the concentrations of pharmaceuticals identified in the environment are typically low, the potential for long term risks to human and ecological health are increasingly being recognized.

This work will evaluate transport processes affecting pharmaceutical movement in the environment, and will study the influence of amphiphiles (e.g., surfactants, phospholipids) on the fate and transport of pharmaceuticals in the environment. Amphiphiles are widely used in pharmaceutical products to stabilize emulsions and enhance drug delivery within the body. In addition, surfactants from detergents and other products are often present in wastewaters, and enter the environment with pharmaceuticals through wastewater discharges. Because of their surface active nature, amphiphiles can have a profound effect on the fate and transport of many contaminants. It is highly likely that the same will be true of their effects on the fate and transport of pharmaceuticals.

Approach:

This work will examine the influence of amphiphiles on the fate and transport of pharmaceuticals through a combination of batch and column adsorption and desorption experiments involving environmentally relevant pharmaceuticals and amphiphiles. Pharmaceuticals and amphiphiles will be used in concentrations covering the range of likely environmental conditions, from ultra-low concentrations (ng/L) of each, through moderate concentrations (mg/L or higher) which might be observed directly at an infiltration source (e.g., a confined animal feeding operation, etc.). Experimental results will be coupled with transport simulation (tracking both surfactants and pharmaceuticals) to assess the potential impact of amphiphiles on the migration of pharmaceuticals.

Expected Results:

The results of this work will provide new insight into the fate and transport of pharmaceuticals. Although amphiphiles are widely used with pharmaceuticals and are present at high concentrations in wastewaters, work examining the influence of amphiphiles on the fate and transport of pharmaceuticals has not been reported to date. The results of this work will provide new quantitative tools for evaluating the transport of pharmaceuticals, and may ultimately lead to reformulation of amphiphiles used in drug delivery to reduce the environmental mobility of pharmaceuticals, enhancing opportunities for natural degradation.

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Riverbank Filtration Effectiveness in an Arid Environment

EPA Grant Number: R829009
Title: Riverbank Filtration Effectiveness in an Arid Environment
Investigators: Richard P. Langford[1], Surresh Pillai[2], Dirk Schulze-Makuch[1]
Institution: [1] University of Texas at El Paso, El Paso, TX;
[2] Texas A & M University, College Station, TX
EPA Project Officer: Angela Page
Project Period: September 1, 2001 through August 31, 2004
Project Amount: $437,418
Research Category: Drinking Water - Disinfection Byproducts

Description:

This experiment is a field test of bank filtration at a site where water level and salinity vary on an annual basis, as they do in many arid and semi-arid streams. No other studies of bank filtration have been performed in this kind of setting. Along the border with Mexico, shallow wells in the Rio Grande alluvium provide untreated water to the residents of many communities. Knowledge about the effectiveness of bank filtration can help prevent disease and provide affordable water supplies for residents of both countries. Additionally, the large cities along the Rio Grande are rapidly drawing down their aquifers and are planning on using Rio Grande water as their primary supplies. Although most cities are planning to use treatment facilities to supply municipal water, bank filtration may provide a cost-effective pretreatment method. Bank filtration is the cleaning of contaminated water by pumping it from a stream through the banks to a well. The objective of this study is to determine whether bank filtration is effective at removing particulates and microbial pathogens in the Rio Grande, an arid stream that exhibits significant annual fluctuations in water quantity and chemistry. This experiment will test bank filtration at a site where water level and salinity vary on an annual basis, as they do in many arid and semi-arid streams. No other studies of bank filtration have been performed in this kind of setting. Waters of different chemistries mix during bank filtration, resulting in complex interactions between soil, bacteria, pollutants and dissolved solids. During bank filtration, organic solids in the river water are strained out into alluvial sediments (Brand et al., 1989; Schwarzenbach and Westall, 1981). Microbial reduction of these organics often creates an anaerobic zone, a few meters wide, in which heavy metals are mobilized. Beyond the anaerobic zone, the subsurface alluvial environment becomes aerobic. In the aerobic zone, trace elements and heavy metals are immobilized and organic pollutants are reduced to harmless compounds.

In humid climates, bank filtration has been shown to remove the majority of dissolved organic constituents and heavy metals [e.g. (Sontheimer, 1980)]. Although bank filtration has been successful in humid climates (Hoetzl et al., 1989; Laszlo and Szekely, 1989), there is little data from arid climates. Bank storage/filtration technology is more difficult to apply to the Rio Grande because of (1) the arid climate, (2) heterogeneous sand-dominated river deposits, and (3) possible long-term salt or arsenic accumulation in the sediments. The overall objective of this research proposal is to determine whether bank filtration is effective at removing particulates and microbial pathogens. The experiments are designed to address the following questions: (1) Is the stream the source of the water? Do stratigraphic heterogeneities reduce the effectiveness of bank filtration? (2) Does variation in salinity and water depth change the effectiveness of bank filtration? And (3) Does pumping rate change the effectiveness of bank filtration?

Approach:

The experiment will be a field experiment conducted at a research site established by the University of Texas at El Paso. The bank-filtration research site offers important advantages as the researchers can manipulate well spacing and pumping rates to best fit the design of the experiment. For this experiment, a very short riverbank to pumping well distance is used to minimize dilution of pathogen species. Wells will be drilled in a cross pattern at the experiment site. Wells along the axis of the cross will document decreases in pathogen, while wells along the cross-bar will document dispersion of the flow between the river and the pumping well. We will characterize the experiment site by detailed analysis of cores collected from the wells. Slugs of Bromide from three injection wells will be used to document the flow paths between the stream and the pumping wells. Multi-level wells will be used to document vertical heterogeneities in flow. Water samples will be collected twice each month during each of the three years of the project. Samples will be collected as soon as flooding begins, and then at two-week intervals during the November to February flooding of the channel. Water samples will be collected twice a month and analyzed for water chemistry. Samples will be analyzed monthly for *Giardia*, *Cryptosporidium*, and *E. coli*. A three dimensional model of water flow between the stream and the well will be created and the effectiveness of bank filtration will be measured. Repeated sampling will document the effects of changes in water chemistry and each year the site will be sampled using a different pumping rate for the experiment well.

Expected Results:

This proposal addresses riverbank filtration in an arid setting and will allow independent evaluation of the influences of seasonal variation in pumping rate and water level. The study will also help determine the utility of bank filtration in a region that desperately is suffering from a limited and polluted water supply. This experiment will test bank filtration at a site where water level and salinity vary on an annual basis, as they do in many arid and semi-arid streams. No other studies of bank filtration have been performed in this kind of setting. This field study will also clearly identify the paths taken by water from stream channel to pumping well, allowing us to isolate the effect of bank filtration from mixing and dilution from existing groundwater.

Type: STAR GRANT
Status: Ongoing
Reports: 2002

Infectivity and Virulence of *Cryptosporidium* Non-*parvum* Species in Healthy Adult Volunteers

EPA Grant Number: R829180
Title: Infectivity and Virulence of *Cryptosporidium* Non-parvum Species in Healthy Adult Volunteers
Investigators: Cynthia L. Chappell, Saul Tzipori, Pablo C. Okhuysen, A. Janecki, Herbert L. DuPont, Giovanni Widmer
Institution: St. Luke's Episcopal Hospital
Tufts University
University of Texas Medical School
University of Texas at Houston
EPA Project Officer: Angela Page
Project Period: September 1, 2001 through August 31, 2004
Project Amount: $524,540
Research Category: Drinking Water - Disinfection Byproducts

Description:

Cryptosporidiosis in humans was thought to be associated with *C. parvum* only, but recent evidence suggests other *Cryptosporidium* species can infect/cause illness in immunocompromised individuals. *C. meleagridis, C. felis*, and *C. muris* have been detected in immunocompromised and immunocompetent humans. These observations raise questions about the role of non-parvum species in community diarrheal illness.

Previous experimental infections in healthy volunteers have used *C. parvum* genotype 2 isolates; further studies of genotype 1 isolates are in progress. Development of the gnotobiotic (GNB) pig model provides a lab host for the amplification of *C. parvum* genotype 1 isolates. Results suggest the GNB pig will support the replication of other *Cryptosporidium* species as well. This advance in identifying a human surrogate makes amplification of non-parvum isolates for use in volunteer studies possible.

Experimental cryptosporidiosis in healthy adults has revealed variability in infectivity, outcome, and immune response to geographically-diverse genotype 2/C isolates. Recent in vitro studies, using a human enterocyte cell line, HCT-8, show that the percent infectivity of the 3 isolates studied in vitro correlates highly with human ID50's, suggesting that this model may serve as an in vitro surrogate to human infections and could be valuable in assessing environmental oocysts for their human disease potential.

Objectives/Hypothesis:

It is hypothesized that non-parvum species of *Cryptosporidium* can replicate and cause illness in immunocompromised individuals; thus, persons with normal immune systems will also be susceptible to infection and illness with these isolates.

The study can be divided into 3 parts: (1) establishment of the *Cryptosporidium* species (*C. felis, C. muris, C. meleagridis* or *C. baileyi*) in lab host(s) and confirmation of genotypic stability, (2) examination of the infectivity and development of the *Cryptosporidium* species, and (3) determination of the infectivity and host response in healthy volunteers challenged.

Approach:

The first objective will be accomplished by passaging the oocysts in GNB pigs or avian species as required. Genotypic analysis will be based on multilocus polymorphism, and genetic stability after passage in animal and human hosts will be followed by specific species biomarkers. Human enterocyte cell cultures will be used to study infectivity and parasite development (all *Cryptosporidium* species). Likewise, infectivity and illness in humans will be studied by challenging healthy adult volunteers with 105 oocysts per subject employing a protocol that has been described in previously published work.

Expected Results:

Documenting infectivity and illness outcomes of humans challenged with non-parvum species will significantly advance the understanding of community acquired cryptosporidiosis and allow the development of more accurate risk assessment models. Antibody and cellular studies in humans will examine the immune response to exposure and/or infection. Fecal samples will be screened for mucosal antibody, which (if found) will be examined for cross-reactivity among antigens from various *C. parvum* species. These studies will be important in understanding *Cryptosporidium* infection in the community and will have significant implications for water quality regulations.

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Gymnodinium breve in the Gulf of Mexico: Gyroxanthin-based Estimates of Carbon-Specific Growth Rates Under Varying Environmental Conditions

EPA Grant Number: R829369
Title: *Gymnodinium breve* in the Gulf of Mexico: Gyroxanthin-based Estimates of Carbon-Specific Growth Rates Under Varying Environmental Conditions
Investigators: Tammi L. Richardson, James L. Pinckney
Institution: Texas A & M University
Department of Oceanography
College Station, TX
EPA Project Officer: Gina Perovich
Project Period: November 15, 2001 through November 14, 2004
Project Amount: $100,387
Research Category: Harmful Algal Blooms

Description:

Determination of in situ growth rates of HAB-forming species is critical to an accurate description of bloom dynamics, but there are currently few reliable methods of directly determining growth rates on natural populations. Photopigment radiolabeling, a method for measuring carbon (C)-specific growth rates of phytoplankton, is based on the determination of synthesis rates of chlorophylls and carotenoids using photosynthetically-assimilated 14C as a radiotracer. This work will examine the use of radiolabeling of the biomarker pigment gyroxanthin as a diagnostic tool for determining growth rates of natural populations of the toxic dinoflagellate *Gymnodinium breve* (recently renamed *Karenia brevis*) in Texas and Florida coastal waters, and will examine effects of varying nutrient and light regimes on *K. brevis* growth rates.

Approach:

We will use batch and semi-continuous cultures to assess growth rate responses of *K. brevis*. Batch cultures will investigate growth rate dynamics under varied environmental conditions, including varying forms and concentrations of nitrogen and three irradiance levels. Samples will be analyzed for inorganic nutrients, urea, cell counts, POC and PON, and photopigments, including gyroxanthin and total chl a. Semi-continuous cultures will allow an evaluation of the photopigment radiolabeling method under conditions of steady state growth, an important assumption of the radiolabeling technique. Growth rates derived from steady-state semi-continuous cultures will be defined as the "true" growth rate for comparisons with other methods. Once we have determined if the gyroxanthin radiolabeling technique gives satisfactory results, we will apply the technique to field investigations of the in situ growth rate of *K. brevis* off Texas and/or the Florida shelf. Work in the field will concentrate on measurements of *K. brevis* growth rates throughout the course of a bloom and in vertical profiles.

Expected Results:

Why does *K. brevis* bloom? In order to address this question from a mechanistic perspective, we need to directly measure *K. brevis* growth rate responses in its natural environment. The fundamental question is whether or not these blooms are caused by changes in the physiology of *K. brevis*, such as an alteration in the population growth rate, or some alteration in their environment that allows this species to out-compete other members of the phytoplankton community. The gyroxanthin-based radiolabeling technique outlined in this proposal will likely prove invaluable as a tool for describing the ecophysiology of *K. brevis* under natural conditions. This research project will address concerns of phytoplankton physiologists as well as resource managers concerned with environmental limitations and controls of toxic dinoflagellate blooms in coastal waters. In light of the possible relationships between anthropogenic nutrient discharges, coastal eutrophication, and red-tide bloom formation, this project has the potential to enhance our understanding of the mechanistic relationship between growth, light, and nutrients for *K. brevis* and closely-related HAB species.

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Human Activities and a Changing Climate in Louisiana

EPA Grant Number: R829420E01
Title: Human Activities and a Changing Climate in Louisiana
Investigators: Michael Dagg
Institution: Louisiana Universities Marine Consortium
EPA Project Officer: Darrell Winner
Project Period: June 10, 2002 through June 9, 2004
Project Amount: $74,534
Research Category: EPSCoR (The Experimental Program to Stimulate Competitive Research)

Description:

Global change will affect Louisiana in numerous ways, including: enhancement of sea-level rise and the associated changes in coastal ecosystems; changing patterns and amounts of fisheries production; changing patterns, amounts and quality of drainage from land to sea; changes in weather and climate: wind patterns; storm frequency and intensity; and long term shifts to non-hydrocarbon energy sources. The Objectives of this project are to develop a coordinated, multi-institutional research and education program addressing aspects of global change most relevant to Louisiana and to enhance Louisiana's capability for understanding and predicting the effects of climate change on state ecosystems, culture, and economy. Three SEERs (Science and Engineering Environmental Research) were selected via a competitive process to address aspects of the broader Global Change (see following abstracts).

Approach:

Specific SIP activities that will be accomplished in support of the SEERs and to develop a broad-based statewide capability for responding to global change issues include: a seminar series, a scientific workshop, partial support for a science writer, development grants for students and postdoctorals, a summer internship program for students from any of Louisiana's universities, travel grants for non-SEER faculty and students to attend national meetings relevant to our Global Change theme, and the teaching of a two week summer course on Climate Change and Human Impacts in Louisiana, to be presented as part of LUMCON's university education program.

Expected Results:

The proposed SIP activities will significantly enhance the more focused activities proposed by the SEERs by providing several means of cross-SEER interaction and activity, and will enhance awareness throughout academia. In addition, we will attempt to reach beyond the scientific community to engage an interested public, a public that will face potentially serious impacts brought about by climate change.

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

How likely is it that fish populations will successfully adapt to global warming?

EPA Grant Number: R829420E02
Title: How likely is it that fish populations will successfully adapt to global warming?
Investigators: Paul L. Klerks, Paul L. Leberg
Institution: University of Louisiana at Lafayette
EPA Project Officer: Darrell Winner
Project Period: June 10, 2002 through June 9, 2004
Project Amount: $121,598
Research Category: EPSCoR (The Experimental Program to Stimulate Competitive Research)

Description:

The proposed research will investigate how likely it is that populations of fish will successfully adapt to temperature changes associated with global warming. A major factor determining the long-term ecological effects of global warming will be whether organisms will be able to adapt to global warming. Successful adaptation would mean that global warming does not displace species from their current habitats. Distribution shifts and extinctions would occur if the organisms would fail to adapt to deleterious effects of global warming. At present there is insufficient information to predict almost any species' evolutionary response to climate change. The question is of special importance to the southeastern U.S., as organisms in warm waters may already be living close to their temperature tolerance limit, and because of the importance of fishery resources to the region's economy.

Approach:

Three questions will be addressed: (1) Are populations potentially able to adapt to temperature changes? This will be addressed through: (a) laboratory selection experiments, (b) determinations of the amount of heritable variation for temperature tolerance in laboratory populations, and (c) comparisons of temperature tolerance between wild populations in waters receiving heated effluents and those in control areas. (2) What is the relationship between population bottlenecks, genetic variation, and a population's ability to adapt to temperature changes? It will be determined if laboratory populations that have experienced specific population bottlenecks differ in their response to selection for temperature tolerance and/or differ in the amount of variation for temperature tolerance that is heritable. (3) What are the consequences of adaptation to temperature changes for long-term survival? Fitness consequences of adaptation will be compared between control and adapted populations. Several fitness components will be determined at individual and/or population levels: genetic variation, growth, reproduction, sexual development, and response to other stressors.

Expected Results:

This research will demonstrate for two specific fish species if they can adapt to increased water temperatures, what the long-term fitness consequences are, and whether the capacity to adapt is affected by a drastic reduction in population size.

Supplemental Keywords: global climate, temperature, ecological effects, vulnerability, genetic variation, aquatic, ecology. , Air, Geographic Area, RFA, Scientific Discipline, Atmospheric Sciences, Ecological Risk Assessment, Ecology and Ecosystems, Hydrology, State, climate change, Global Climate Change, Louisiana (LA), aquatic ecology, climate variability, coastal ecosystems, fish habitat, genetic diversity, global change, global warming, land and water resources, watershed

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Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Saltwater intrusion on the gulf coast: an assessment of the interactions of salinity stress, genetic diversity and population characteristics of fish inhabiting coastal marshes

EPA Grant Number: R829420E03
Title: Saltwater intrusion on the gulf coast: an assessment of the interactions of salinity stress, genetic diversity and population characteristics of fish inhabiting coastal marshes
Investigators: Paul L. Leberg, Paul L. Klerks
Institution: University of Louisiana at Lafayette
PO Box 42451
Lafayette, LA 70504
EPA Project Officer: Darrell Winner
Project Period: June 10, 2002 through June 9, 2004
Project Amount: $133,410
Research Category: EPSCoR (The Experimental Program to Stimulate Competitive Research)

Description:

A consequence of climate change is the intrusion of saltwater into freshwater systems. Coastal Louisiana is currently experiencing higher than expected salinities in traditionally freshwater marshes and waterways. Studies of the effects of saltwater intrusion on resident animals are usually limited to documenting community changes. There has been little investigation of effects of saltwater intrusion on the demography and genetic structure. We propose to use the rapidly changing situation in Louisiana?s coastal marshes to understand how increasing salinity affects populations of resident fishes. Our objective is to examine how increasing salinity affects the ecology, demography, population structure, and genetic variation. The model organism for this research will be the western mosquitofish (Gambusia affinis) a wide spread and common predator that has been the subject of numerous studies on the effects of environmental stress on individual viability. We will test the hypothesis that increasing salinity is influencing genetic variation through demographic bottlenecks and local adaptation. We will also examine the hypothesis that fragmentation, associated with sea-level rise, will increase genetic differentiation among populations, as well as extinction of local populations.

Approach:

We will assess demographic and genetic characteristics of populations exposed to different levels of salinity stress in both the field and experimental mesocosms. . Field sampling will be conducted in two separate hydrological basins across a salinity gradient including fresh, intermediate, and brackish marsh. We will assay genetic variation using microsatellite and allozyme markers to determine if increased salinity leads to changes in genetic diversity and interpopulation genetic differentiation through effects on population size and habitat fragmentation. Using mesocosms, we will determine if losses of genetic diversity, likely to occur with decreases in population size resulting from salinity exposure, affect the viability of fish populations in recovering freshwater environments, as well as in habitats with continued exposure to increased salinity. Experimental manipulations and field sampling will also be used to determine if a population's history of exposure to increased salinity affects subsequent viability in brackish and freshwater environments.

Expected Results:

This research will contribute to our understanding of how saltwater intrusion affects animal populations and helps address efforts to protect and restore coastal marshes. The project will support efforts to develop a combination of field sampling, molecular assays, and experimental approaches using model organisms to address problems of environmental change in the state's coastal marshes.

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Modeling the impacts of climate change on wetland ecosystems

EPA Grant Number: R829420E04
Title: Modeling the impacts of climate change on wetland ecosystems
Investigators: Vibhas Aravamuthan, Robert Twilley, Joseph N. Suhayda, Vijay P. Singh, Jagannathan Ramanujam, David Koppelman, Ganesh Thiagarajan
Institution: Louisiana State University - Baton Rouge , University of Louisiana at Lafayette , University of Missouri - Kansas City
EPA Project Officer: Darrell Winner
Project Period: June 10, 2002 through June 9, 2004
Project Amount: $129,210
Research Category: EPSCoR (The Experimental Program to Stimulate Competitive Research)

Description:

The overall goal of this project is to develop a coupled global climate model and hydrologic/landscape ecology model for assessing the impact of climate change on the hydrology and ecology of Louisiana wetlands. Due to the complex interaction between the climatologic, hydrologic and ecologic processes, an integrated approach to study these processes is proposed.
The proposed work involves the integration of a Global Climate Model, an overland flow hydrologic model, a coastal hydrodynamic model, and a landscape ecology model. The model would address the issue of integrating processes occurring at widely varying spatial and temporal scales. Although the model would be applied to Louisiana wetlands, it would not be site specific, and should be applicable to other regions with minimal effort. Special attention would be paid to algorithmic development so that the model would be architecture independent. This would be achieved by developing the model code using the Fortran 90 language with High Performance Fortran extensions, so that the model could be run on both uniprocessor and multiprocessor shared memory or distributed memory systems.

Approach:

A stochastic weather generation model will be developed and calibrated using data archived at the Southern Regional Climate Center in LSU. The hydrologic and hydrodynamic components of the model will be calibrated and verified using river stage and tide gage data collected by the United States Geological Survey and the United States Army Corps of Engineers. The landscape ecology model will be calibrated using satellite images and aerial photographs.

Expected Results:

The model will be used to study the climatological impacts on the hydrology and ecology of coastal Louisiana. The climatological scenarios include global warming due to increased CO2 emissions and sea level rise predicted by the global climate model. The results of this study should be of interest, to a broad spectrum of agencies and individual researchers who are involved in making scientific and management decisions regarding the protection, planning and restoration of wetlands. Expected contributions of this study are: improved understanding of the coupled interactions between the climatologic, hydrologic and ecologic factors at time scales of decades, and a first step towards the development of an effective tool for the management and restoration of ecosystems.

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Interactions among climate, humans and playa wetlands on the Southern High Plains

EPA Grant Number: R829641
Title: Interactions among climate, humans and playa wetlands on the Southern High Plains
Investigators: Scott T. McMurry, W. P. Dayawansa, L. M. Smith, D. B. Willis, C.F. Martin, K. R. Dixon, C. W. Theodorakis
Institution: Texas Tech University
EPA Project Officer: Vivian Turner
Project Period: May 1, 2002 through April 30, 2005
Project Amount: $900,000
Research Category: Assessing the Consequences of Global Change for Aquatic Ecosystems: Climate, Land Use, and UV Radiation

Description:

The hydroperiod of a playa wetland is influenced by climate (e.g., temperature, frequency and amount of rainfall), landscape (e.g., grassland, cropland), and the current amount of sediment in the playa. Sedimentation in a playa is influenced by the type of landscape surrounding it, such that land use surrounding a particular playa ultimately affects its hydroperiod. We hypothesize that climatic variability, and past, current, and future land use practices (e.g., crop production, conversion to grasslands) dictate hydroperiod and spatial distribution of wet playas. This, in turn, influences the ecological structure of vegetation and animal communities that rely on playa lakes for many life history requisites.

Approach:

Amphibian, avian, and plant communities will be described for 40 playas with varying hydroperiods in grassland and cropland landscapes. Climate stations at each playa will provide local information on precipitation, temperature, etc. These data will be incorporated into models and/or used to test model predictions to understand the interaction between climate test model predictions to understand the interaction between climate changes and land use patterns, and their influence on sedimentation in and hydroperiod of playa wetlands. Several existing models will be used and integrated to predict the direct and interactive effects of changing climate and land use practices on playa wetland dynamics, and responses of agricultural producers to changes in climate and costs of production over time.

Expected Results:

This research will generate two sets of complimentary results. The first set of results will provide understanding of the direct effects climatic change will have on the ecology of the playa lake systems, agricultural land productivity (both cropland and grassland), and agricultural input requirements (fertilizer, water, seed, etc.) in the Southern High Plains. The second set of results will compliment the first set, and focus on the human dimension of climatic change, and will answer two important questions. First, how will agricultural producers modify land management practices to mitigate the effect of climatic change, and secondly, how will these changes in agricultural resource management impact the ability of playa lake ecological systems to adapt to climatic change.

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Evaluating Microbial Indicators and Health Risks Associated with Bank Filtration

EPA Grant Number: R829785
Title: Evaluating Microbial Indicators and Health Risks Associated with Bank Filtration
Investigators: Frost, Floyd , Kunde, Twila
Institution: Lovelace Clinic Foundation
2309 Renard Pl. SE
Albuquerque, NM 87106
EPA Project Officer: Page, Angela
Project Period: July 1, 2002 through July 31, 2005
Project Amount: $524,840
Research Category: Microbial Risk in Drinking Water

Description:

The study design will be a prospective two year study during which sera and water quality data will be collected from several sites in Nebraska where drinking water is derived from three types of sources. Lincoln, Nebraska is a city of 225,000 with an economy based on agriculture, education and government employment. Lincoln uses bank filtered drinking water obtained from the Platt River. The water is directly filtered and ozonated. Kearney, Nebraska is a city of 25,000 that uses bank filtered water from the Platt River that is chlorinated. Kearney has no additional water treatment. Kearney's economy is based primarily on agriculture and the city is located approximately 80 miles west of Lincoln. A series of small towns around Lincoln will be used as ground water cities. Each uses well water obtained sufficiently distant from the Platt River that it is not under the direct influence of surface water. Two of these communities are Waverly, which is a community of 5,000, located approximately 5 miles east of Lincoln, and Ashland, which is a town of 1,000 located 15 miles east of Lincoln. Sera will be tested for evidence of prior infection from *Cryptosporidium*.

Approach:

Sera from 50 people from each of three communities (users of bank filtered and chlorinated, bank filtered plus direct filtration plus ozonation and chlorinated ground water) will be collected at baseline and at 5 follow-up blood draws. A questionnaire on risk factors will be collected at each blood draw. Sera will be tested for the presence of antibody responses to two *Cryptosporidium* antigens (15/17-kDa and 27-kDa) and for serological changes (seroconversion). The baseline level of serological responses as well as the rates of seroconversion will be compared for each population (50 baseline and 250 periods for estimating rates of seroconversion) for each population. Comparisons will adjust for collected risk factor data from each individual. For purposes of extrapolating these results to other locations, a series of source and finished water quality indicators will be measured for each water source.

Expected Results:

Although the absence of oocysts in the finished water might be considered an indicator of safe water, oocyst detection methods are unreliable. This study will compare rates of infection in the user populations for three source/treatment groups. This approach can more accurately identify increased risks of waterborne *Cryptosporidium* transmission than oocyst detection. Source water will be characterized for indicators of microbial organisms and removal of pathogens. Particle sizes distributions before and after bank filtration will also be characterized. In prior studies, increased risks of infection have not been related to increased risk of illness; however, the increased risks of infection indicate that viable oocysts have passed through the treatment plant. This study will have the power to detect a difference in the seroconversion between bank filtered and other water systems of 10%, less than differences in serconversion rates seen in earlier studies of surface versus ground water users.

Type: STAR GRANT
Status: Ongoing
Reports: No Reports Available Yet

Linking Population and Physiological Diversity in a Toxin-producing Dinoflagellate

EPA Grant Number: R830413
Title: Linking Population and Physiological Diversity in a Toxin-producing Dinoflagellate
Investigators: Lisa Campbell, John R. Gold
Institution: Texas A & M University
EPA Project Officer: Gina Perovich
Project Period: September 1, 2002 through August 31, 2005
Project Amount: $464,880
Research Category: Ecology and Oceanography of Harmful Algal Blooms (ECOHAB)

Description:

1.Optimizing a suite of hypervariable, nuclear-encoded DNA markers (microsatellites) that have been developed to characterize genetic diversity among isolates of *K. brevis*;

2.Establishing clonal cultures of *K. brevis* during the onset, bloom, and decline of a red tide event in order to assess genetic and physiological variability within a bloom; and

3.Testing the following null hypotheses: (a) spatial/temporal samples from a single bloom are genetically homogeneous; and (b) geographic isolates of *K. brevis* from the northern Gulf are genetically homogeneous.

Approach:

A suite of microsatellite markers will be employed as tools to link diversity and structure of isolates of *K. brevis* with the physiological and ecological bases of bloom formation. This is the first broad-scale application of microsatellites in studies of toxic dinoflagellates. For each clonal isolate established during the course of a bloom event, allele distributions at approximately 10 - 15 microsatellite loci will form the basis for tests of temporal (genetic) homogeneity. Physiological characterization of unique clones will consist of determining growth rates and cellular brevetoxin levels at three light irradiances and five salinities in a factorial design. Data analysis primarily will include tests of spatial and temporal homogeneity (including molecular analysis of variance or AMOVA) of allele (haplotype) distributions (frequencies). Estimates of haplotype (nucleon) diversity and intrapopulational nucleotide diversity will also be generated.

Neighbor-joining of genetic distance matrices will be used as a means to assess genetic and evolutionary relationships among spatial and temporal samples.

Expected Results:

A database for dinoflagellate microsatellite alleles will be initiated for the Gulf. Initial results will assess population-genetic structure and elucidate levels of genetic variation and diversity within blooms as they develop. Ultimately, results will provide profiles of genetic and ecological diversity on appropriate spatial and temporal scales to test rigorously hypotheses regarding various environmental variables and how they affect and influence bloom formation and population structure of species of *Karenia*. The work will be critical to interpretation of dynamics of field populations and in models used to predict occurrences of harmful algal blooms.

Section 3.3

Listings 101 to 115

STAR Fellowship Pink Pages

Type: STAR FELLOWSHIP
Status: Ongoing
Reports: No Reports Available Yet

Reductive Dehalogenation at Electrodes

EPA Grant Number: GF9500575
Title: Reductive Dehalogenation at Electrodes
Investigators: Richard Presley
Institution: New Mexico Highlands University
EPA Project Officer: Virginia Broadway
Project Period: May 1, 1995 through
Project Amount: $23,830
Research Category: Fellowship - Chemistry

Description:

For this project a new pump and treat method is proposed in which halocarbon contaminated groundwater is detoxified by passage over carbon cathods. These contaminants rank prominantly in frequency of occurrence at superfund sites. Many of these resist oxidative treatment , hence reductive treatments are needed. The kinetics, products and mass balances of reduction of CCl_4, C_2Cl_4, and C_6Cl_6 at carbon cathodes will be studied. Both bare and devitalized C electrodes will be used. This technology may also be effective in treatment of nitroaromatics and nitrosamines. Currently the best available treatment technique for the destruction of these chlorinated volatile organic compounds appears to be air stripping followed by catalytic oxidation. Drawbacks to this method are largely the result of incomplete oxidation. Direct reduction of halocarbons at metal surfaces, electrodes, and photoelectrodes has seen only modest investigation for potential treatment methods. Three important criteria that will determine the value of such techniques are the absolute reaction rates for halocarbon reduction; the extent of dechlorination; and the relative rates of water electrolysis vs. dechlorination.

Approach:

The work will involve bench-scale studies initially focused on the efficacy of bare electrodes. The controlled potential electrolysis with coulometry in gas tight cells gives the necessary information to establish the energy efficiency. Sampling of gas and liquid phases and analysis by GC-MS and GC-EC afford the fate and rate data. The reaction will be studied as a function of pH applied potential, ionic strength, aerobically and in the presence of nitrates. Depending on the initial findings electrode derivation will be investigated.

Type: STAR FELLOWSHIP
Status:Ongoing
Reports: No Reports Available Yet

Culture, Science and Uncertainty: Conflicting Positions on Climate Change

EPA Grant Number: GF9500913
Title: Culture, Science and Uncertainty: Conflicting Positions on Climate Change
Investigators: Myanna Lahsen
Institution: Rice University
EPA Project Officer: Virginia Broadway
Project Period: August 1, 1995 through
Project Amount: $23,452
Research Category: Fellowship - Social Sciences

Description:

The central purpose of this project is to provide a framework to aid policy-makers' interpretation of conflicting scientific positions on anthropogenic climate change and to inform scientists about influential extra scientific dimensions of their work of which they may not be aware. This project will attempt to fill a void in studies concerning climate change. While the role of extra scientific factors in expert positions on climate modeling and climate change often is recognized, and calls have been made for studies to clarify their dynamics and influence no such in-depth study has yet been done. Research on climate change is dominated by physical sciences, and, with some exceptions the scarce social science research that has been done related to climate change tends to focus on how humans contribute to and are affected by the changes.

Approach:

This project differs significantly from such studies with its focus on how climate change is constructed as a problem by climate scientists in the first place, how these scientists estimate the seriousness of its effects, and the social influences shaping their estimates. The in-depth, ethnographic nature of this study also distinguishes it from the extant preliminary surveys of expert opinion on climate change and investigations into the extra-scientific dimensions of scientific understandings of climate change . The approach adopted here is informed by constuctivist and cultural studies of science. Constructivist approaches focus on the role of social contexts in the creation of knowledge as it is produced by communities with strong commitments to specific socio-cultural and professional practices, assumptions, values, and modes of discourse. Therefore, this study is the result of informed by historical and sociological studies of the role of differently oriented scientists in environmental politics and of how social dynamics have shaped the trajectories of climate-related theories. The ways in which scientific theories and discussions on climate change reflect differences in predispositions related to cultural, social, and professional backgrounds, affiliations, values, and belief-systems will be investigated through data obtained by standard interview and archival methods, as well as participant -observation. The central mechanism for analysis is qualitative and comparative in nature, informed in part by methods of qualitative data analysis described by Werner & Schoepfle (1986). Snowball sampling will work to include the most prominent and influential scientists. The project will also probe scientists' assumptions about the future for insight into value and belief systems, as studies have suggested how future images reveal assumptions about humans' ability, or lack thereof, to influence and control the natural environment and about the possibility and desirability of social change. Ethnographic study of environmental values in American culture will also be helpful in the selection and formulation of interview questions; their study proved how best to select and word interview questions about values to obtain meaningful responses. Analyses of rhetoric provide insight into how to adjudicate among competing values, prescriptions, or knowledge claims, through considerations of how culture, politics, power, and ideology influence the discourses of science.

Type: STAR FELLOWSHIP
Status: Ongoing
Reports: No Reports Available Yet

Intrinsic Bioremediation: Process Demonstration and Evaluation

EPA Grant Number: GF9502150
Title: Intrinsic Bioremediation: Process Demonstration and Evaluation
Investigators: Derek Williamson
Institution: University of Texas at Austin
EPA Project Officer: Virginia Broadway
Project Period: August 15, 1995 through
Project Amount: $31,500
Research Category: Fellowship - Engineering

Description:

The objectives of this research are to use field site data and samples to: 1) demonstrate that the primary natural attenuation mechanism for mobile polyaromatic hydrocarbons (PAHs) at selected remediation sites is biological transformation, 2) indicate conditions in soil and ground water systems under which intrinsic bioremediation will occur, and 3) provide parameters that may be used as input for models of intrinsic bioremediation under field conditions.

Approach:

To accomplish the objectives of this study several sites must be identified and involved parties must be willing to provide access to site data samples. At least one site from each of the following three classes will be used: class 1) sites where compounds of concern are mobile, the saturated zone is the zone of interest, aquifer solids contain low levels of organic carbon, and the source has been removed; class 2) similar to class 1 except that a source is still present; and class 3) characterized by the presence of low mobility residual organics from prior remediation processes. The first step is determining if the site soils are capable of degrading the compounds of concern. The second step is to demonstrate the occurrence of intrinsic bioremediation by monitoring 1)compounds of concern, 2)electron acceptors, and 3) nutrient levels in the soil and ground water phases at the demonstration sites. Wells and soil cores will be used to provide these samples. Monitoring will be performed periodically, so that rates of removal of chemicals and rates of depletion of electron acceptors and nutrients can be determined. This research will integrate field and lab data to provide a better understanding of the fate of PAHs in the subsurface under natural conditions.

Expected Results:

By working closely with industrial site representatives the project will reflect "real world" engineering needs and will provide input data needed by the modeling community to more accurately describe intrinsic bioremediation at coal-tar and wood-preserving sites.

Type: STAR FELLOWSHIP
Status:Ongoing
Reports: No Reports Available Yet

Land Use and Natural Butterfly Populations: Assessing Anthropogenic Effects

EPA Grant Number: GF9502211
Title: Land Use and Natural Butterfly Populations: Assessing Anthropogenic Effects
Investigators: David A. Boughton
Institution: University of Texas at Austin
EPA Project Officer: Virginia Broadway
Project Period: August 1, 1995 through
Project Amount: $27,814
Research Category: Fellowship - Ecology

Description:

Objective: The purpose of this project is develop an approach to evaluating and predicting the effects of land use on natural butterfly populations. Two studies will be conducted.

Approach:

The first study will examine differences in the mechanisms of colonization in empty habitats in areas of highly disturbed, logged clearings versus colonization of low- disturbance, selectively logged forests in the Sequoia National Forest in California. The project will quantify response to differences to habitat, including spatial structure, temporal structure, and parasitoids, and behavior, including habitat preference, search efficiency. The information developed under this study will be applied to computer models to identify critical information and the relationship between model accuracy and completeness.

A second study, conducted on populations of tropical butterflies in Costa Rica, will examine extinction risks from three different kinds of land use, including preservation, low-level extraction, and high-disturbance agriculture. For this study, landscape patterns will be characterized using images obtained by remote sensing, species will be selected and monitored to characterize the land use impacts to species of differing biotic connectivity, habitat use and mobility, and changes to habitat occupancy will be monitored and recorded.

Expected Results:

The data developed under this study will be used to assess the effects of land use alternatives on index values for each species evaluated, and attempts will be made to predict impact of land use on additional species with similar biotic traits.

Type: STAR FELLOWSHIP
Status:Ongoing
Reports: No Reports Available Yet

Development and Demonstration of a Hollow Fiber Membrane Bioreactor for Co-metabolic Degradation of Chlorinated Solvents

EPA Grant Number: U915323
Title: Development and Demonstration of a Hollow Fiber Membrane Bioreactor for Co-metabolic Degradation of Chlorinated Solvents
Investigators: Jonathan G. Pressman
Institution: University of Texas at Austin
EPA Project Officer: Delores Thompson
Project Period: August 26, 1998 through
Project Amount: $31,412
Research Category: Fellowship - Environmental Engineering

Description:

Contamination of groundwater and soils with chlorinated aliphatic solvents is a widespread problem. One promising approach for treating chlorinated solvents is to destroy them through cometabolism in aerobic biological processes. Cometabolism requires a supplemental carbon and energy source for the bacteria, as the chlorinated solvents do not meet this need. This research will develop a new technology to address challenging chlorinated solvent problems. The technology will treat chlorinated methanes, ethanes and ethenes, will handle mixed wastes containing chemicals that are toxic to the organisms, and will be applicable to both contaminated water and air streams.

This new technology is based on a specialized methane-degrading bacteria, Methylosinus trichosporium OB3b PP358, developed in our laboratory and on a new type of bioreactor, a hollow fiber membrane reactor. A hollow fiber membrane reactor provides a protective barrier between the organisms and the contaminated water or air, because only the volatile chemicals can cross the membrane. The reactor also allows a very high degree of control over the biological process, so that maximum biodegradation rates can be obtained. The objectives of this research include the following:

Demonstrate successful performance of the hollow fiber membrane bioreactor for treating TCE contaminated water.

Demonstrate successful performance of the hollow fiber membrane bioreactor for treating TCE contaminated air.

Understand the fundamental interactions between/among microbial metabolism and bioreactor performance.

Understand the engineering design variables in order to develop a system design strategy.

Extend hollow fiber membrane bioreactor studies to other chlorinated solvents and mixtures of chlorinated solvents.

This research will identify important process variables, the interactions among them, the appropriate system configuration, and the best operating strategies. Computer models of the process will be refined to assist in analysis, design and operation of the process.

Type: STAR FELLOWSHIP
Status:Ongoing
Reports: No Reports Available Yet

Environmental transport modeling

EPA Grant Number: U915324
Title: Environmental transport modeling
Investigators: Roseanna M. Neupauer
Institution: New Mexico Institute of Mining and Technology
EPA Project Officer: Delores Thompson
Project Period: August 24, 1998 through
Project Amount: $25,006
Research Category: Fellowship - Environmental Engineering

Description:

Environmental transport modeling is commonly used to estimate the concentration of a contaminant at is moves away from its source. For example, models can be used to estimate dissolved oxygen concentration in a river downstream from a wastewater treatment plant discharge; to estimate sulfur dioxide concentration downwind from an off-gas emissions stack; and to estimate the concentration of benzene in groundwater downgradient of a gasoline leak. These models are called source-based models because the source location and release history are known or assumed to be known, and the concentration of the contaminant downgradient of the source is estimated. In many situations, contamination is observed at a receptor such as a groundwater monitoring well, but the source location and source history are unknown. For these receptor-based problems, source-based models can be used to identify the source locations; however, a new technique called receptor-based modeling is more efficient. With a receptor-based model, the contaminant concentration at the receptor is known, and the corresponding source strength for a source at any upgradient location is estimated.

Approach:

The overall objective of this research is to develop a receptor-based modeling technique to improve characterization of known sources of groundwater contamination and to identify previously unknown sources of groundwater contamination. For this application of the receptor-based model, a contaminant is detected in a monitoring or production well; thus, the well is the receptor. If contamination is detected in a well, we can use receptor-based modeling to obtain a probability distribution for the prior location of the contaminant. This method can also be used to obtain a probability distribution for the travel time of the contaminant to the point of detection from some upgradient location. The goal of the proposed research is to determine the effects of multiple detections on the probability distributions. The additional information from multiple detections is expected to reduce the variance of the probability distribution and therefore provide a better estimate of the source location.

Type: STAR FELLOWSHIP
Status:Ongoing
Reports: No Reports Available Yet

Image Use in the Characterization of Field Parameters

EPA Grant Number: U915329
Title: Image Use in the Characterization of Field Parameters
Investigators: Garey A. Fox
Institution: Texas A & M University
EPA Project Officer: Delores Thompson
Project Period: June 1, 1998 through
Project Amount: $27,613
Research Category: Fellowship - Agricultural Engineering

Description:

Determining appropriate management practices relies heavily on intense field measurements requiring significant time and resource use. However, the site-specific variability within field resources has been documented using new sources of technology, such as aerial photography, remote sensing, image processing, and radar. Recent research has focused on the use of remote sensing and aerial photography data to determine the nutrient availability within an area using spectral-reflectance based measures. With an expected doubling of the world population over the next forty years, food production must increase substantially in order to meet the increase in food demand. Precision farming is regarded as the next step in food production technology to increase land productivity in a sustainable fashion. Under precision farming, a field is divided into smaller homogeneous management units, each of which can be managed based on its production capacity. Data describing soil and crop conditions of each management unit are gathered on a routine basis. Currently, spatial data describing the soil characteristics and productivity potential are based on intensive soil sampling on a grid and on yield monitoring using mechanical monitors. These methods are time consuming and expensive, and an alternative method is needed.

Approach:

The goal of the proposed project is to develop a procedure for determining soil characteristics and crop conditions based on imagery. The procedure will involve three steps. First, the research will involve the acquisition of data through field and laboratory experiments. Then, the development and evaluation of image processing algorithms to extract information from digital photographs will occur. This step will include the selection of appropriate measures relating spectral reflectance to the soil and vegetation properties of interest to growers. Finally, the research will focus on the development of procedures for simulating crop growth and estimating potential yields, which will involve integrating geo-referenced data describing the production field with a crop growth model, and devising a framework to include the remotely sensed imagery as a method to define production inputs. The main question revolves around whether this new technology can predict soil, water, and vegetative variables required in determining site-specific management decisions.

Expected Results:

This information will lead to determining whether mass and energy balances can be calculated using this new source of data, rather than through intense field measurements. With the use of advanced technology in field measurement, current methods of soil variability can be replaced by environmentally sensitive and cost-effective methods.

Type: STAR FELLOWSHIP
Status: Ongoing
Reports: No Reports Available Yet

Natural hybridization

EPA Grant Number: U915345
Title: Natural hybridization
Investigators: Jonathan Alan Rosenfield
Institution: University of New Mexico
EPA Project Officer: Karen Morehouse
Project Period: August 24, 1998 through
Project Amount: $23,343
Research Category: Fellowship - Zoology

Description:

Natural hybridization is common among plant and animal species. Introgression occurs when hybrids reproduce with members of one (or both) of the parental species that produced the hybrids. Both hybridization and introgression can cause rapid evolution (e.g., speciation or extinction). When introgression occurs between a common species and a rare species, the rare species is frequently extirpated as its gene pool is assimilated by the hybrid swarm. This process is a major threat to the conservation of genetically and phenotypically unique native diversity.

Approach:

I will use the rapid introgression between two pupfish species, the Pecos pupfish (Cyprinodon pecosensis) and the sheepshead minnow (Cyprinodon variegatus) to study the forces that may contribute to extirpation-through-introgression. I will explore the effect of differences in hybrid ecology, life history, and differential patterns of sexual selection on the formation, maintenance, and spread of the hybrid swarm between these two species. A variety of laboratory tests will be employed to uncover differences in these factors.

Type: STAR FELLOWSHIP
Status: Ongoing
Reports: No Reports Available Yet

Liquid Phase Mass Transfer in Spray Contactors

EPA Grant Number: U915396
Title: Liquid Phase Mass Transfer in Spray Contactors
Investigators: Norman K. Yeh
Institution: University of Texas at Austin
EPA Project Officer: Delores Thompson
Project Period: September 1, 1998 through
Project Amount: $25,524
Research Category: Fellowship - Chemical Engineering

Description:

Objective: In spray contactors such as those found in limestone slurry scrubbing of flue gas, the formation of drops increases the gas-liquid contact area and improves the mass transfer between the gas stream and the spray droplets. The rate of mass transfer may be gas or liquid film controlled, depending on where most of the resistance to mass transfer occurs. The gas phase mass transfer coefficients for liquid drops falling in gases have been measured and agree with theoretical predictions. However, the liquid phase mass transfer coefficients do not agree with models very well, and mass transfer in limestone slurry scrubbing is believed to be primarily liquid film controlled. The goal of this research is to obtain quantitative relationships between the liquid phase mass transfer coefficients and operating parameters for spray scrubbing (e.g. nozzle type, liquid flowrate etc.).

An experimental spray column will be constructed to measure the liquid phase mass transfer coefficients in sprays representative of those found in flue gas desulfurization. Mass transfer rates in drops are strong functions of drop size and drop formation. Therefore, the drop sizes and dynamic behavior of drops in spray scrubbing will be reproduced with a commercial scale nozzle. Working with a commercial scale nozzle provides several challenges, including high liquid flowrates and drop velocities. Thus, the experimental column will be designed to sample only a small fraction of the total spray. The desorption of CO_2 in an air-water system will be studied to determine the liquid phase mass transfer coefficients, since the low solubility of CO_2 in water tends to make the mass transfer liquid film controlled. Liquid samples will be collected and analyzed to obtain CO_2 concentration as a function of distance from the nozzle. Drop size and contact time will have to be determined from correlations or measurements, e.g. with photographic methods. Using the drop size and contact time, liquid phase mass transfer coefficients will be calculated. This procedure should allow the effects of nozzle selection and liquid flow rate on the mass transfer coefficient to be quantified.

Type: STAR FELLOWSHIP
Status: Ongoing
Reports: No Reports Available Yet

Critical body residues and ion-exchange membranes as measures of heavy metal bioavailability and toxicity in soil

EPA Grant Number: U915465
Title: Critical body residues and ion-exchange membranes as measures of heavy metal bioavailability and toxicity in soil
Investigators: Jason Conder
Institution: Oklahoma State University - Main Campus
EPA Project Officer: Dale Manty
Project Period: August 17, 1998 through
Project Amount: $23,858
Research Category: Fellowship - Toxicology

Description:

The ultimate goal of my research is to better understand the bioavailability of cadmium (Cd), lead (Pb), and zinc (Zn) to soil organisms, both as individual contaminants and as a mixture of metals. Traditional chemical analyses of soils, which determine total heavy metal content, are often not well correlated with toxicity due to a host of modifying factors such as pH, organic matter content, and clay content. A more appropriate approach is to estimate the fraction of metals available for uptake by soil organisms: the bioavailable fraction.

Approach:

Two methods of estimating the bioavailable fraction of metals will be investigated: i) earthworm metal residues and ii) ion-exchange membrane uptake. Single- and multiple- metal toxicity tests using the earthworm Eisenia fetida and ion-exchange membrane exposures will be carried out in artificial soil. Toxic units will be calculated from the single-metal tests in order to evaluate mixture toxicity of the multiple-metal test. During all toxicity tests, moribund earthworms will be collected to determine critical body residues (CBRs) for each metal, providing a link between body residues and acute toxicity. Critical body residues will also serve to further investigate mixture toxicity. Ion-exchange membrane uptake will be compared to CBRs to investigate their use as possible surrogates for earthworm bioassays.

Type: STAR FELLOWSHIP
Status: Project Period Concluded
Reports: 2000, 2001

An Enhanced Aerosol Size Distribution Methodology

EPA Grant Number: U915618
Title: An Enhanced Aerosol Size Distribution Methodology
Investigators: Roderick R. Pearson
Institution: University of Texas at El Paso
EPA Project Officer: Virginia Broadway
Project Period: August 1, 1999 through August 1, 2002
Research Category: Fellowship - Earth Sciences

Description:

The objective of this research project is to develop an alternative means to analyze atmospheric tropospheric aerosol physical properties from radiance measurements. An additional goal is to create a template for monitoring atmospheric aerosol distributions for local and regional entities complying with the U.S. Environmental Protection Agency?s regulations on air quality.

Approach:

The initial phase of the project will be the analysis of existing models of multi-scattering theory. This will allow for the documenting of strengths and weaknesses of each model. Upon completion of the documentation phase, the possibility of developing a new and more accurate, first-principles model for electromagnetic scattering from a single aerosol particle will be explored. This model would substitute for the corresponding algorithms in the existing radiative transfer codes. From these existing models, the proper methodology will be improved and developed to do a more accurate aerosol size distribution inversion using remote sensing data (e.g., MISR and ground-based radiometers). The inversion data will be validated by statistical comparison with several data sources. One source will be the T-Matrix, MIE, and Dipole approximation models. A secondary source will be modeled dispersion data coupled with particulate monitoring station data to give an overall particle size distribution profile for the local airshed. The dispersion data will be derived from a prognostic meteorological model, the Penn State/NCAR Mesoscale Modeling System (MM5). MM5 will be used to develop wind profiles in the analysis of aerosol dispersion in the local airshed.

Expected Results:

A newly developed theory for electromagnetic scattering from a single irregularly shaped aerosol particle should compare well with standard methods such as MIE and the Dipole approximation.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5419/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5419/report/2001

Type: STAR FELLOWSHIP
Status: Project Period Concluded
Reports: 2000, 2001

Atmospheric Organic Nitrogen - Origin, Speciation, and Significance in Global Marine Biogeochemistry

EPA Grant Number: U915635
Title: Atmospheric Organic Nitrogen - Origin, Speciation, and Significance in Global Marine Biogeochemistry
Investigators: Kimberly A. Mace
Institution: Texas A & M University
EPA Project Officer: Georgette Boddie
Project Period: August 1, 1999 through August 1, 2002
Research Category: Fellowship - Oceanography

Description:

The goals of this research project are to: (1) measure total organic nitrogen (N) and total inorganic N in rain, bulk, and particle size-separated aerosols; (2) measure specific forms of atmospheric organic nitrogen (AON) to include urea and amino acids, and to relate them to total organic N as determined in goal number 1; (3) compare historical and present-day concentrations of organic N in ice core samples to determine the influence of human-induced change on organic N totals; (4) evaluate biomass burning as a potential source of organic N; and (5) evaluate the N isotope signatures of total organic N to ascertain possible sources.

Approach:

Sites for the study include an atmospheric sampling tower-based background monitoring station located at Cape Grim, Tasmania, Australia; an atmospheric sampling tower located on the windward coast of Oahu, Hawaii; an atmospheric sampling tower located on the Turkish Mediterranean coast; and wet and dry season samples collected from a biomass burning region in central Amazonia, Brazil. Samples will be analyzed for total inorganic and organic N. The organic portion of samples will be determined primarily by ultraviolet (UV) oxidation using a Metrohm 705 UV digestor (Metrohm, Switzerland). Other methods, such as persulfate digestion, also will be evaluated. Amino acids will be determined by a dabsyl chloride (DABS-Cl) method for high performance liquid chromatography (HPLC). Urea will be determined using both an ion chromatography (IC) method and a standard colorimetric method. N isotopes will be evaluated on a number of samples and possibly for individual organic species within the organic N pool.

Ice core samples from Greenland will be analyzed using the methodology above to determine whether AON is a predominantly anthropogenic component.

Expected Results:

Expectations concerning the origin of organic nitrogen in the atmosphere are premature at this time. It is likely that many different sources contribute to the composition of the organic N fraction, and that these sources are largely the result of land use patterns.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5245/report/2000

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5245/report/2001

Type: STAR FELLOWSHIP
Status: Ongoing
Reports: 2001

The Roles of Calcium-dependent Signal Transduction and Environmental Xenobiotic Chemicals in Modulating Ovarian Steroidogenesis in Sciaenids

EPA Grant Number: U915731
Title: The Roles of Calcium-dependent Signal Transduction and Environmental Xenobiotic Chemicals in Modulating Ovarian Steroidogenesis in Sciaenids
Investigators: Abby Diane Benninghoff
Institution: University of Texas at Austin
EPA Project Officer: Jason Edwards
Project Period: August 1, 2000 through August 1, 2003
Research Category: Fellowship - Environmental Toxicology

Description:

The goal of this research project is to investigate xenobiotic chemical disruption of calcium-dependent signaling as a potential novel mechanism of endocrine disruption in the Atlantic croaker (Micropogonias undulatus) and spotted seatrout (Cynoscion nebulosus), two sciaenid species inhabiting coastal areas in the Gulf of Mexico. The importance of calcium signaling in hormonal control of ovarian steroid production has been demonstrated in numerous vertebrate species. Therefore, the specific objectives for this research project are to: (1) characterize the calcium-dependent signaling pathways regulating ovarian steroid production, and (2) investigate xenobiotic chemical alteration of these calcium signaling pathways.

Approach:

The first phase of research involves the characterization of calcium-dependent signal transduction in ovarian steroidogenic cells. Specific pharmacological drugs, such as calcium channel blockers, calcium ionophores and calmodulin inhibitors, will be used in in vitro static incubation of ovarian tissue to elucidate the role of specific components in calcium signaling pathways regulating ovarian steroid production. A primary cell culture system will be developed for Atlantic croaker ovarian steroidogenic cells to directly measure changes in intracellular calcium concentrations in response to hormone treatments. The second phase of research will investigate xenobiotic disruption of calcium-dependent signal transduction and subsequent alteration of ovarian steroidogenesis. Preliminary experiments will study effects of xenobiotic chemicals on normal endocrine function by screening a variety of compounds including heavy metals, pesticides, and polychlorinated biphenyls (PCBs). Compounds causing significant alteration in steroid production in the preliminary assays will be selected for continued experiments to elucidate whether the chemical is altering endocrine function by modifying calcium-dependent signal transduction. In vitro ovarian tissue incubations will be used to assess effects of contaminants on ovarian steroidogenesis, and ovarian steroidogenic cells in primary culture will be used to determine direct effects of xenobiotics on calcium homeostasis.

Expected Results:

Alternative mechanisms of endocrine disruption will be identified and bioassays will be developed to identify the chemicals acting by these parthways.

Progress and Final Reports:

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5506/report/2001

Type: STAR FELLOWSHIP
Status: Project Period Concluded
Reports: 2001

Treatment of Arsenic Contaminated Drinking Water

EPA Grant Number: U915800
Title: Treatment of Arsenic Contaminated Drinking Water
Investigators: Cassia M. Sanchez
Institution: New Mexico State University
EPA Project Officer: Virginia Broadway
Project Period: December 1, 2000 through December 1, 2001
Research Category: Engineering

Description:

The objective of this project is to test the efficiency of akaganeite, an iron oxide, as an ion adsorption media in removing arsenic (As) in drinking water sources.

Approach:

First, the absorbent material, akaganeite, an iron oxide precipitate, is prepared by incubation of a ferric chloride solution. The efficiency of the precipitation process is tested using colorimetric techniques. A batch study then is conducted, using the akaganeite precipitate in suspension, and given a known concentration of As in solution. The batch studies are conducted in a controlled environment and the samples are analyzed by a graduate student in the chemistry department using an atomic adsorption spectrophotometer. Unfortunately, the akaganeite is fragile and cannot withstand the hydraulic forces in a typical filtration environment. A rigid and porous media is required to fix the material, so it can then be used in filtration devices. Different types of crystalline structure media, such as zeolites or pumice, are being considered. A bench-scale column evaluation will be performed to determine the efficiency of As removal and the amount of iron leaching from the column media.

Expected Results:

In the 1996 amendments to the Safe Drinking Water Act (SDWA), Congress directed the U.S. Environmental Protection Agency (EPA) to issue a proposed rulemaking by January 1, 2000, and take final action on an arsenic rule a year later. This is a very critical time to revise the process to more fully consider both health benefits and costs of imposing new limits. The maximum contaminant level (MCL) for As was 0.050 milligrams per liter, and the EPA is considering lowering the limit to 10 micrograms per liter. An estimated 50 percent of the communities in New Mexico would be in violation if the SDWA standard for As is set below 50 micrograms per liter. This problem extends beyond New Mexico into the surrounding states of Utah, Colorado, and other southwest areas. The smaller communities would not be able to handle the fines imposed for not meeting the regulations set by the Act, so an economical solution must be developed. This research is expected to result in the development of an economical approach for removing As from drinking water sources to levels at or below the proposed 10 micrograms per liter level.

Progress and Final Reports:

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1963/report/2001

Type: STAR FELLOWSHIP
Status: Ongoing
Reports: 2001

Habitat Requirements and Evolution of *Agrostis rossiae vasey*, a Grass Endemic to Thermal Soils in Yellowstone National Park

EPA Grant Number: U915807
Title: Habitat Requirements and Evolution of *Agrostis rossiae vasey*, a Grass Endemic to Thermal Soils in Yellowstone National Park
Investigators: Michael T. Tercek
Institution: Tulane University of Louisiana
EPA Project Officer: Virginia Broadway
Project Period: August 1, 2000 through August 1, 2003
Research Category: Fellowship - Ecology and Ecosystems

Description:

The goals of the research project are to: (1) use genetic markers to determine the phylogenetic relationship between *Agrostis rossiae* and closely related congeners, thus determining whether *A. scabra* and *A. rossiae* are sister taxa; (2) determine whether *A. rossiae* is a valid, monophyletic taxon or an ecotype; (3) explain the geographic distribution of *A. rossiae* in terms of ecological variables and determine the reasons for its endemism; and (4) calculate levels of gene flow between *A. rossiae* populations and between *A. rossiae* and co-occurring *A. scabra*.

Approach:

Measurements of soil temperature, moisture, and chemical composition will be combined with common garden and greenhouse experiments to determine the ecological factors responsible for the geographic separation of *A. rossiae* and *A. scabra*. RAPDs will be used for the phylogeny and gene flow calculations.

Expected Results:

Populations of *A. rossiae* are potentially threatened by invasive plant species. It is important to know if *A. rossiae* is a valid taxon, worthy of conservation effort. Documented cases of parallel evolution are rare, and should it be found that *A. rossiae* has arisen more than once in different thermal communities, this study will be interesting from a theoretical standpoint. Determination of the ecological factors responsible for the restricted distribution of *A. rossiae* will aid any conservation efforts and/or explain the reasons for its divergence from *A. scabra.*

Progress and Final Reports:

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5517/report/2001

Section 3.4

Listings 116 to 155

SBIR Grant Yellow Pages

Type: SBIR PHASE II
Status: Ongoing
Reports: No Phase II Reports Available Yet

High-Performance, Low-Global-Warming Refrigerants for Domestic Refrigerators

EPA Contract Number: 68D99082
Title: High-Performance, Low-Global-Warming Refrigerants for Domestic Refrigerators
Investigators: Jonathan S. Nimitz
Small Business: Environmental Technology and Education Center Inc.
4500-B Hawkins Street, NE
Albuquerque, NM 87109
EPA Contact: Manager, SBIR Program
Phase: II
Project Period: September 1, 1999 through September 1, 2001
Project Amount: $224,966
Research Category: SBIR - Pollution Prevention

Description:

Two new nonflammable, nontoxic, nonfractionating, environmentally safe, medium-pressure refrigerant blends with performance superior to chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, and other alternatives have been discovered. These refrigerants, called Ikon? A and B, have attractive physical properties, zero ozone depletion potential, low global warming potential, and low total equivalent warming impact (TEWI). Both appear superior in safety performance and environmental properties to any other available alternatives. They have been shown to be thermally stable, have low toxicity, and are compatible with common materials. They could eliminate the need for the global warming refrigerant R-134a and the ozone-depleting refrigerant R-12 as well as allow improved energy efficiency that will reduce the amounts of carbon dioxide and other pollutants produced. Tests by the EPA, Dole Foods, and ETEC have shown that Ikon refrigerants have 10 to 30 percent better energy efficiency than current refrigerants. In Phase I, both refrigerants were dropped directly into a new domestic refrigerator and tested for performance. Phase I results show that the new refrigerants could save 10 to 15 percent of the energy used by domestic refrigerators and reduce refrigerant TEWI by about 13 percent.

In Phase II, a domestic refrigerator will be optimized to provide maximum performance and third party performance. Extended operation performance and compatibility testing also will be accomplished to prepare the product(s) for commercialization.

The anticipated result is a superior refrigerant product for commercialization in the domestic and small commercial refrigerator and freezer market. In the United States in 1990, 112.6 million refrigerators and 32.4 million freezers were in residential use, representing a total energy consumption of 188.6 billion kWh or 640 trillion Btu. The result of this effort will be a new refrigerant that will give at least 10 percent better energy efficiency than R134a. In a typical new domestic refrigerator, it is estimated that the new refrigerant will save approximately $4.15 per year versus its estimated extra cost of $5.60 for a payback period of 1.4 years. Approximately 8.5 million new refrigerators and freezers are sold in the United States annually. Because the average refrigerator or freezer contains about 0.1 kg of refrigerant, and average leak rate (including repairs and life end) is about 2 percent, the OEM market represents about 1.5 million kg/year. The new refrigerant also is expected to be attractive in other high specific energy use cooling and refrigerant applications. World markets are perhaps twice the U.S. market.

Progress and Final Reports:

1998 Phase I Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1630/report/1998

Final Phase I Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1630/report/F

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Type: SBIR PHASE II
Status: Completed
Reports: Final

New Environmentally Benign Heteropolymolybdate Conversion Coatings for Aluminum Alloys

EPA Contract Number: 68D00203
Title: New Environmentally Benign Heteropolymolybdate Conversion Coatings for Aluminum Alloys
Investigators: Zoran Minevski
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: II
Project Period: September 1, 2000 through September 1, 2002
Project Amount: $225,000
Research Category: SBIR - Pollution Prevention

Description:

For 50 years, the chromium conversion process has been unsurpassed as a method for protecting aluminum from corrosion. The method is used extensively to protect aluminum parts for the aerospace, automobile, construction, and consumer products industries. More than 25,000 tons of chromium are used in metal finishing annually. There is an urgent need to replace the chromium conversion process because chromium is a potent human carcinogen. Concern exists not only about workplace exposure at high levels, but also about environmental exposure at much lower levels. Producers now risk high liability claims and have the burden of high waste disposal costs. Recent government and industry reports have concluded that no existing coatings can adequately replace the chromium conversion process.

During Phase I, a fundamentally new chromium-free inorganic conversion coating for aluminum was developed. Test results using industry and military test protocols have shown that the coating meets rigorous corrosion protection and paintability standards. The coating does not contain hazardous chemicals, and it is effective on several aluminum alloys (Al 2021 and Al 6061). In addition, it has the potential to undergo self-repair when the aluminum surface is scratched or damaged. This Phase II project is a collaborative effort, between Lynntech and leading companies in the metal finishing industry, to develop this coating to a point where it is suitable for use by industry.

Many current users of the chromium conversion process (e.g., General Motors, Eastman Kodak, Texas Instruments, Raytheon, and United Technologies) are actively seeking ways to reduce or eliminate the use of chromium in metal finishing. Lynntech, Inc.'s proposed coating has high commercial potential because it meets many of the customer-defined specifications for chromate-free conversion coatings and includes provisions for the private sector to fund substantial amounts of the development costs.

Summary/Accomplishments:

Phase II tests demonstrated an exceptional corrosion resistance of the new coating prepared from formulations consisting of heteropolymolybdates and several important additives. Some coatings outperformed the chromate-based conversion coatings in electrochemical corrosion resistance tests and passed a standard 14-day salt fog test. The key to this technology is heteropolymolybdates, in which the primary effect of the hetero atom (Mn, V, Ce, Si) is an effective transformation of Mo (III) and Mo (IV) to stable Mo (V) and Mo (VI), thereby enhancing the formulation of conversion coatings on aluminum alloys.

Progress and Final Reports:

Final Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1375/report/F

Type: SBIR PHASE II
Status: Ongoing
Reports: No Phase II Reports Available Yet

A Novel Method for Converting a Negative Value Waste into a Commodity Chemical

EPA Contract Number: 68D01056
Title: A Novel Method for Converting a Negative Value Waste into a Commodity Chemical
Investigators: Adrian J. Denvir
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: II
Project Period: September 1, 2001 through September 1, 2003
Project Amount: $225,000
Research Category: SBIR - Hazardous and Solid Waste

Description:

It is estimated that there are approximately 300 million tires discarded each year in the United States and this is in addition to the 800 million scrap tires that reside in landfills and tire dumps throughout the country. About 180 million are recycled, and the remaining 120 million scrap tires are discarded (legally or illegally) in landfills or tire dumps. Current tire reuse technologies offer a considerable opportunity to generate valuable materials from what is essentially worthless scrap. There are significant market barriers preventing these technologies from reaching their economic potential.

Considering all of the potential markets for crumb rubber as a polymer filler, the one with the greatest potential is the production of rubber pavements. However, inconsistencies in the quality of the final pavement have resulted in a decrease in popularity. During the Phase I effort, Lynntech successfully demonstrated a low-temperature process to generate surface modified crumb rubber. Addition of the chemically activated crumb rubber was shown to solve many of the problems associated with rubber pavement production. This new asphalt has improved settling characteristics, resistance to fatigue, and resistance to thermal cracking. The asphalt also had better high-temperature viscosity and the curing time was reduced by half compared to traditional crumb rubber blends. During the Phase II effort, Lynntech will expand on the scope of Phase I by building and testing a field deployable crumb rubber treatment system and, for proof of concept, Lynntech will use the treated crumb rubber to lay a test section of highway. The potential for success is high. Lynntech will be working with the Center for Asphalt and Materials Chemistry at Texas A&M University. The Center is recognized world wide for its advances in asphalt chemistry and has developed several formulations that have been used on several sections of highway in Texas.

The commercial potential for this technology is enormous. Foresight Science and Technology performed an independent economic evaluation on the use of ozone-treated crumb rubber for pavement construction. The domestic market alone was estimated at $15 million for the first year of operation, increasing to $120 million after 5 years. During the course of the evaluation, Lynntech and Foresight have identified several other lucrative markets including automotive rubber products (tire retreads, hoses, belts, etc.), protective matting, and soil amendments. Lynntech has already identified several potential commercial partners who have invested resources into commercialization of this technology.

Progress and Final Reports:

2000 Phase I Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1380/report/2000

Final Phase I Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1380/report/F

Type: SBIR PHASE II
Status: Completed
Reports: 2000, Final

A New Microfluidic System for the Determination of *Cryptosporidium* Oocysts in Water

EPA Contract Number: 68D01064
Title: A New Microfluidic System for the Determination of *Cryptosporidium* Oocysts in Water
Investigators: Dalibor Hodko
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: II
Project Period: September 1, 2001 through September 1, 2003
Project Amount: $225,000
Research Category: SBIR - Monitoring and Analysis

Description:

Cryptosporidium, originating from contamination of public drinking water supplies, ponds, rivers, or swimming pools, have cause large-scale and deadly outbreaks, which became a major cause of waterborne infectious diseases. Since 1991, the percent of outbreaks attributable to *Cryptosporidium* has doubled, and in the 1993-1994 period, 17 percent of all outbreaks were caused by *Cryptosporidium.* In 1996, 42 states reported 2,426 cases to the Centers for Disease Control. Such outbreaks prompted EPA to establish new regulations for monitoring raw and finished water systems. For instance, EPA's Information Collection Rule and Enhanced Surface Water Treatment Rule require that all large public water systems routinely conduct microbiological monitoring of raw and finished waters. Smaller utilities are likely to face compliance deadlines before 2004. Even though EPA's current recommended detection limit is 10 oocysts/L, the Agency likely will impose stricter requirements in the future. The currently available method for detection of *Cryptosporidium* oocysts, Method 1622, is very laborious, yields poor oocysts recovery, cannot be performed in the field, and needs highly trained professionals to accurately perform the analysis. This fluorescent microscopy-based method is strongly affected by nonspecific fluorescence by other organisms and chlorine compounds present in the sample. The proposed new method is based on two innovations, one which utilizes (di)electrophoretic separation, concentration, and focusing of *Cryptosporidium* oocysts in a microfluidic sensor, and the other using on-chip polymerase chain reaction (PCR) and electrochemical detection of DNA amplicons.

The Phase I results clearly demonstrated the feasibility of electrical separation of *Cryptosporidium* oocysts as well as an enhanced and highly sensitive method for electrochemical detection of *Cryptosporidium* DNA amplicons. The results indicated that the full system development would provide competitive detection limits for in-field testing of oocysts and cysts. The Phase II project will further optimize the design parameters for separation and detection systems. A prototype microfluidic analyzer with on-chip PCR detection will be designed, built, and thoroughly tested. It is planned to perform an interlaboratory comparison of results obtained using the proposed method and the current EPA Method 1622/1623.

Because of the simplicity of the design of new PCR primers and selective recognition of characteristic DNA templates, the proposed microfluidic analyzer will find a large number of applications in detection of other microorganisms in the field or on production lines, e.g., in food, chemical, environmental, or biotechnological industries. The same principles could be used for detection of cells in biological fluids; thus, the analyzer offers numerous biomedical and pharmaceutical applications.

Progress and Final Reports:

2000 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1385/report/2000

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1385/report/F

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Recycling of Polypropylene Carpet Waste into Polyester Carpet Backcoating

EPA Contract Number: 68D10058
Title: Recycling of Polypropylene Carpet Waste into Polyester Carpet Backcoating
Investigators: Albert G. Hoyle
Small Business: Hoyle Associates
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1991 through March 1, 1992
Project Amount: $49,600
Research Category: SBIR - Hazardous and Solid Waste

Description:

In the manufacture of cross-lapped, needlepunched, polypropylene, pile-surfaced carpeting, there is unavoid- able edge trim waste due to the inherent nature of the cross- lapping and needlepunching processes. This waste in its present form is useless to anyone and is presently being disposed of by dumping into a landfill site by a disposal company. Typical small businesses have to pay to have this waste removed and lose monthly at least $12,500 in fiber and backcoating as a result of this waste disposal. The disposal material decreases available landfill capacity by about 10,000 pounds per month (the amount of waste generated). In this project, Hoyle Associates propose to find the means to convert this waste into granular or fibrillar material which could be used as a heat-reactive backcoating binder for polyester needlepunched carpeting also manufac- tured by a typical small business in this market.

The waste carpeting, when converted into granular or fibrillar form, could be utilized in backcoating as follows:

(1) applying it to the back of polyester carpeting, heating to melt the polypropylene, then smoothing and resolidify' the molten material as it leaves the heat source, and

(2) melting it and applying to the back of polyester carpeting while in a molten state.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Multi-Vortex System for Recovering Volatile Organic Contaminants from Industrial Gas

EPA Contract Number: 68D10062
Title: Multi-Vortex System for Recovering Volatile Organic Contaminants from Industrial Gas
Investigators: Meredith C. Gourdine
Small Business: Energy Innovations Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1991 through March 1, 1992
Project Amount: $49,500
Research Category: SBIR - Air

Description:

More cost effective systems are needed for recovering volatile organic contaminants (VoCs) from industrial ex- haust gas. The proposed approach is to cool the gas well below the dew point of the VOCS. Normally, ice and dirt form on the condensing surface, reducing the heat transfer rate, requiring shut-down and preventive maintenance. Energy Innovation, Inc.'s, innovation will eliminate these requirements. Mathematical models will be generated and experiments conducted for verification of the proposed theory.

The object of this research is to demonstrate the feasibility of building a reliable, compact VOC recovery system with a substantial reduction of energy requirements.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Improved Method for Heating Catalytic Converters of Vehicles to Attain Ultra-Low Emissions

EPA Contract Number: 68D30124
Title: Improved Method for Heating Catalytic Converters of Vehicles to Attain Ultra-Low Emissions
Investigators: Oliver J. Murphy
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1993 through March 1, 1994
Project Amount: $50,000
Research Category: SBIR - Air

Description:

The three-way catalytic converter is the most important device making today's automobiles comply with existing emission laws. The first two or three miles in a typical 22-minute, 12-mile commute in today's vehicles result in the emission of half of the total non- methane hydrocarbons, which result in the production of urban smog, as well as half of the toxic CO emissions. This occurs because the catalyst in the converter will operate ineffectively until it reaches its optimal operating temperature.

To meet new California and Federal standards specified for transitional low emission vehicles, low emission vehicles, and ultra-low emission vehicles, new technologies are presently being developed to lower the warm-up time for catalytic converters. This is required to bring about significant reductions in emissions of HC's primarily and CO and to a lesser extent in NOx. Technologies involving "passive" and "active" methods for rapidly bringing catalytic converters to useful operating temperatures (250?C under cold-start conditions (nominally -10?C to 25?C) are currently being investigated. However, all of these technologies, including "close-coupled" catalytic converters, on-board heat storage systems, Exhaust Gas Ignition approach and electrically heated converters suffer from various disadvantages and drawbacks.

In this proposal, a new chemical method of rapidly heating catalytic converters is proposed that addresses the weaknesses of the alternative technologies. Basically the new method involves using an on-board hydrogen bleed into the exhaust system upstream of the catalytic converter which will instantly allow the catalyst to reach its light-off temperature.

Type: SBIR PHASE II
Status: Project Period Concluded
Reports: No Reports Available Yet

Improved Method of Heating Catalytic Converters of Vehicles to Attain Ultra-Low Emissions

EPA Contract Number: 68D40065
Title: Improved Method of Heating Catalytic Converters of Vehicles to Attain Ultra-Low Emissions
Investigators: Oliver J. Murphy
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: II
Project Period: September 1, 1994 through June 1, 1996
Project Amount: $165,000
Research Category: SBIR - Air

Description:

The present generation of gasoline- and methanol-fueled vehicles tested according to the EPA's Federal Test Procedure emit 70-80% of exhaust emissions during the first minute or two following "cold-start". This is primarily due to the ineffectiveness of existing catalytic converters to oxidize hydrocarbons (HC's) and carbon monoxide(CO) until they have reached catalyst light-off temperatures (~350 degrees C). Thus, rapidly increasing the temperature of a catalytic converter under vehicle "cold-start" conditions is of paramount importance in reducing HC and CO emissions to meet new California and Federal emission standards.

In a Phase I SBIR project, Lynntech, Inc., demonstrated the feasibility of a new and innovative chemically heated catalyst (CHC) approach to heat a catalytic converter prior to a "cold-start". The approach is based on the spontaneous, low-temperature, flameless, catalytic combustion of hydrogen in the presence of air over highly dispersed novel metal catalysts. The exothermic hydrogen-oxygen recombination reaction generates heat locally, right at the noble metal catalyst particles where it is needed.

The overall objective of this Phase II project is to determine the effectiveness of the novel CHC approach for reducing emissions under "cold-start" conditions using a real vehicle. The Phase II development work will be directed toward:

1. design and fabrication of a low-cost CHC breadboard unit;

2. installing the breadboard unit in an actual vehicle and evaluating its performance under "cold-start" conditions; and

3. determining emission levels (non-methane hydrocarbons, NMHC's, together with CO and NOx) on testing the CHC breadboard unit according to the EPA's Federal Test Procedure.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

A Near-Infrared Diode Laser-Based Continuous Emissions Monitor for Nitrogen Oxides

EPA Contract Number: 68D50068
Title: A Near-Infrared Diode Laser-Based Continuous Emissions Monitor for Nitrogen Oxides
Investigators: Alan C. Stanton
Small Business: Southwest Sciences Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1995 through March 1, 1996
Project Amount: $65,000
Research Category: SBIR - Monitoring and Analysis

Description:

This project addresses the development of diode-laser-based continuous-emissions monitors (CEMs) to meet the emissions monitoring requirements imposed on a wide range of industries by Federal and state clean air regulations. The overriding objective is the development of new, highly reliably instrumentation that has substantially lower long term operating and maintenance costs than existing instruments used in CEM applications. The instrument approach to be developed and tested in Phase I and Phase II will be readily extended to measurement of additional gases, such as carbon monoxide and methane. Detection limits for all gases will be 1 part per million or better in a measurement period of less than 30 seconds.

The Phase I/Phase II program will culminate in field testing of a prototype CEM. Key technical issues to be resolved during the program include:

1.optimizing sensitivity for detection of NO using a near-infrared diode laser,
2.deciding the feasibility of using a single diode laser to detect both NO2 and O2, and
3.verifying the effectiveness of their proposed low-cost, fully automated, self-calibration method.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Dual Purpose Electrochemical Treatment of Wastewater

EPA Contract Number: 68D50100
Title: Dual Purpose Electrochemical Treatment of Wastewater
Investigators: Charles Tennakoon
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1995 through March 1, 1996
Project Amount: $65,000
Research Category: SBIR - Hazardous and Solid Waste

Description:

Industrial wastewater containing toxic waste compound and metal ions pose many problems of disposal. The most generally used method of removing metal contaminants is lime treatment to precipitate metals as hydroxides. The metal is not normally recovered resulting in the need for sludge disposal. The cost of sludge disposal plus fewer available disposal sites makes that method increasing less attractive. Alternative methods of metal ion removal (e.g. ion exchange and reverse osmosis) have several drawbacks including high equipment costs. Oxidation of organic compounds in wastewater and simultaneous electrowinning of metals as described in this proposal are of great economic and environmental significance.

This proposal describes research to demonstrate the feasibility of using a three dimensional packed bed electrode as the anode for the oxidation of organic compounds and another packed bed electrode as the cathode for metal ion deposition. The two packed beds are separated from each other by a porous separator and operated as the anode and cathode of a single electrochemical reactor. The proposed method utilizes electrocatalytic conducting particles as the anode bed material for oxidation of organics primarily to carbon dioxide and nitrogen. The metal deposited on the particles forming the cathode bed can be dissolved anodically to form a concentrated solution of metal ions which can then be used for further processing to recover metals.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Electronics Industry Waste Stream Reduction

EPA Contract Number: 68D50120
Title: Electronics Industry Waste Stream Reduction
Investigators: Craig C. Andrews
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1995 through March 1, 1996
Project Amount: $65,000
Research Category: SBIR - Pollution Prevention

Description:

No one questions the philosophy that it is better to avoid industrial pollution rather than to attempt the clean up of an environmentally abused site. Unfortunately, we are slow to learn this lesson and hazardous wastes become more exotic and continue to increase. Causing 21 of the 28 EPA superfund sites in the Silicon Valley (Witkowski and Menon 1991), the semiconductor industry was, and continues to be, a major produce of hazardous waste.

In the fabrication of chrome-plated masks, several chemicals and a significant fraction of the chromium are washed down the drain. Lynntech, Inc. proposes the application of a conducting polymer as a replacement for the resist and mask, eliminating many of the chrome-plate preparation steps and wastes. In contracts to traditional lithography (where the molecular weight of the resist is altered during exposure), substrates are spin-coated with a monomer and the desired pattern is exposed. The exposed regions polymerize, permanently adhering to the plate and replacing the chrome. The unexposed monomer may be rinsed away with water and is easily removed from the waste stream. The polymer itself is environmental friendly, and the simplification of mask preparation lowers the number and amount of hazardous chemicals which are presently necessary.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Self Contained Electrochemical System for Treating Paint Residue

EPA Contract Number: 68D60025
Title: Self Contained Electrochemical System for Treating Paint Residue
Investigators: Charles Tennakoon
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1996 through March 1, 1997
Project Amount: $70,000
Research Category: SBIR - Hazardous and Solid Waste

Description:

Disposal of paint residue from aircraft depainting operations poses a problem as the polymeric paint contains toxic metal impurities. The metals (particularly chromate) cause the entire spent media and paint residue to be classified as a hazardous waste.

The innovative approach described in the proposal deals with: 1) leaching of toxic metals into an aqueous phase by acid digestion; 2) combined removal of toxic metals by precipitation using an electrochemical step; and 3) electrodeposition from a mixed metal solution to form a chromium containing alloy. It is anticipated that acid digestion would detoxify the polymeric waste for disposal in a landfill. The process is novel because it both extracts the metallic impurities from the paint residue and then recovers the metals in the form of an alloy.

In Phase I, bench-scale proof of concept studies will be carried out to demonstrate the principles of the innovation. This will provide the technical foundation to develop a lab-scale reactor to conduct parametric studies to obtain necessary data for scaling up the process, and validate the bench-scale results.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Treatment of Produced Water from Coal-Bed Methane Production Using Carbon Aerogel Technology

EPA Contract Number: 68D60031
Title: Treatment of Produced Water from Coal-Bed Methane Production Using Carbon Aerogel Technology
Investigators: Charles C. Patton
Small Business: BPF Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1996 through March 1, 1997
Project Amount: $69,854
Research Category: SBIR - Water

Description:

Coal-bed methane (CBM) is an increasingly important source of natural gas. Current production levels within the U.S. exceed 970 bcf/year. Disposal of produced water from CBM production can be expected to be a continuing problem for the foreseeable future. However, the high cost of water disposal and lack of efficient technology for treatment are barriers to expanded development of CBM reserves. Many of the areas where CBM is produced are arid or semi-arid and can benefit from creation of additional water supplies. If the water from CBM can be economically and efficiently treated to make it acceptable for surface discharge, it becomes a resource instead of a waste. Benefits can be achieved through both agricultural uses and domestic uses depending on the quality of the treated water which can be achieved. Treatment for surface discharge currently requires the application of reverse osmosis (RO) technology. This proposal will demonstrate the effectiveness of capacitive deionization (CDI) technology for the treatment of CBM produced water. This technology should prove to be more reliable and cost effective than RO. In addition, CDI uses approximately 1/10 of the energy of RO and has a significantly smaller secondary waste stream than RO in this application.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

High Efficiency Biofilter for Styrene Removal from Indoor Air

EPA Contract Number: 68D60044
Title: High Efficiency Biofilter for Styrene Removal from Indoor Air
Investigators: C. V. Wikstrom,
Small Business: Bioengineering Resources Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1996 through March 1, 1997
Project Amount: $70,000
Research Category: SBIR - Air

Description:

Fiberglass boat manufacturing operations in the United States produce large amounts of volatile organic carbon (VOC) emissions, especially styrene and acetone. It is estimated that 2 to 140 tons of styrene are formed per plant per year and a total of 20,150 tons are emitted each year in the United States.

It is proposed to utilize the ability of microorganisms to completely mineralize both acetone and styrene from air in fiberglass boat manufacturing facilities. A mixed culture will be developed for this purpose. A biofilter will then be constructed for the removal of these volatile and toxic substances. This filter should be highly efficient for the removal of VOC in air and would be inexpensive to operate.

Finally, a preliminary process development study will be undertaken to identify parameters and design constraints necessary for a Phase II demonstration, and to attract industrial collaborators.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Low Cost Heavy Metals Removal from Hazardous Wastewaters

EPA Contract Number: 68D70025
Title: Low Cost Heavy Metals Removal from Hazardous Wastewaters
Investigators: Milan Bartos
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1997 through March 1, 1998
Project Amount: $70,000
Research Category: SBIR - Water

Description:

Heavy metal species mobilized and released into the environment by technological activities tend to persist indefinitely, circulating and eventually accumulating throughout the food chain, posing a serious threat to the environment, animals, and humans.

Typical industrial metal-containing discharges can be considered as point-source emissions, which in turn offer the possibility of feasible remedial actions. The existing technologies for heavy metals removal, however, do not always offer the best possible scenario when the process efficiency, recycling capabilities, cost, and increasingly stringent regulations and disposal limits are critically considered.

The new concept of removing heavy metals from hazardous waste streams, presented in this Phase I proposal, offers a low-cost, environmentally benign, highly efficient process based on natural waste materials available at an extremely low price. Preliminary results clearly demonstrated the feasibility and a high potential of the new technology to efficiently remove and recycle typical heavy metal contaminants from industrial wastewaters.

The objective of the proposed research is to identify the key features and optimize specific process parameters to achieve the maximum removal efficiency. The anticipated results will provide a sound base for further development and upscaling of the new technology in the follow-on stages.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Silica Materials for Mercury Recovery From Wastewater

EPA Contract Number: 68D70040
Title: Silica Materials for Mercury Recovery From Wastewater
Investigators: Franklin O. Kroh
Small Business: TPL Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1997 through March 1, 1998
Project Amount: $70,000
Research Category: SBIR - Water

Description:

A number of industrial processes generate wastewater with mercury contamination. Existing cleanup processes have difficulties in achieving low mercury discharge limits, especially in the presence of competing metal ions already below their discharge limits. Commercial ion exchange media are not selective for mercury, so other metal ions compete with mercury for binding sites. Consequently, excessive amounts of ion exchanger are required.

This Phase I project will develop two series of highly selective silica materials for removing mercury from contaminated wastewater. Relative to the low selectivity of state-of-the-art materials, up to four orders of magnitude less material will be required to achieve mercury discharge limits. In Phase I, the silica materials will be synthesized. Each will be evaluated for mercury capacity, selectivity relative to competing ions, ease of regeneration and reclamation of metal, and cost of production.

If successful, the silica materials will be useful for the purification of wastewater generated in chloralkali manufacture, metal plating, battery recycling, and dentistry.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Novel Field Deployable Electrochemical Sensor for the Detection and Long-Term Monitoring of Pollutants

EPA Contract Number: 68D70042
Title: Novel Field Deployable Electrochemical Sensor for the Detection and Long-Term Monitoring of Pollutants
Investigators: Adrian J. Denvir
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1997 through March 1, 1998
Project Amount: $70,000
Research Category: SBIR - Monitoring and Analysis

Description:

Chlorinated hydrocarbons represent the most prevalent contaminants of groundwater in the country. When released in the subsurface, they tend to persist below the water table, and it can take decades or centuries before slow-moving groundwater completely dissolves accumulations of chlorinated solvent product. Analytical methods currently available for monitoring these compounds require extensive sample handling and time-consuming laboratory analysis. There is an ever increasing need for the development of reliable and sensitive in situ methods for the long-term monitoring of chlorinated solvents in groundwater. This Phase I project will develop an onsite remotely operated pollution monitor for chlorinated solvents. The method is based on a unique combination of electrochemical reactions configured to minimize interferences from other components in the test solutions, but maximize sensitivity to the target pollutants. The system will be designed to operate within the Berlioz currently used to locate and characterize contaminants in soil and groundwater. In Phase I, the feasibility of the sensor design will be demonstrated by carrying out bench-scale exploratory development.

Type: SBIR PHASE I
Status: Completed
Reports: Final

Electrochemical Treatment of Textile Effluents with Simultaneous Recovery of Toxic Metals

EPA Contract Number: 68D98114
Title: Electrochemical Treatment of Textile Effluents with Simultaneous Recovery of Toxic Metals
Investigators: Charles Tennakoon
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1998 through March 1, 1999
Project Amount: $70,000
Research Category: SBIR - Water

Description:

The large quantity of aqueous waste generated by the textile industry is a significant environmental problem. Dye effluents contain chemicals that are toxic to fish and mammalian species. There is currently no single economically feasible method of treating textile effluents. Conventional biological processes have not proven to be particularly effective. Similarly, for disperse dyes, carbon adsorption and ozonation result in poor color removal. Chemical coagulation and reverse osmosis result in a large proportion of color removal, but the former produces large amounts of toxic sludge while the latter involves high capital costs. The novel concept in this Phase I project deals with treating textile wastewaters by an electrochemical approach where oxidation of organic waste is achieved together with the recovery of toxic metals (chromium and copper) found in textile dyes. High molecular weight dyes are decomposed into low molecular weight compounds, which are amenable to biodegradation. Preliminary results have clearly demonstrated the feasibility and the high potential of the new technology to efficiently decompose textile dyes and recover toxic metals resulting from dye decomposition. The objective of this SBIR project is to identify the key features and optimize specific process parameters to achieve maximum process efficiency.

Summary/Accomplishments:

Currently, the textile dyeing industry is under considerable pressure to reduce the color of process waters directly discharged to municipal water treatment facilities. While the color issue has received considerable attention, more recently heavy metals (copper and chromium in particular) found in some dyes, and the toxicity of organics formed by the degradation of dyes and dye auxiliaries are being considered within the framework of pretreatment regulations. Furthermore, the Environmental Protection Agency (EPA) is attempting to reduce the hazards associated with waste sludges disposed of in landfill sites through the requirements of the Toxicity Characteristics Leachate Procedure (TCLP). Metals such as chromium and selected organics, including some acknowledged dye breakdown products, e.g., aromatic amines, are the focus of concern. Additionally, under federal mandate, states are establishing stream water quality standards which will tighten National Pollution Discharge Elimination System (NPDES) permits.

In this Phase I effort, two approaches were investigated to treat textile effluents. The electrochemical treatment by anodic oxidation using anodes with catalytic coatings effectively oxidized the dye wastes. However, three industrial effluents tested generated chlorine gas during anodic oxidation making the process, limited in it?s applicability due to the possibility of forming chlorinated byproducts. Cathodic treatment using electrochemically assisted Fenton's reagent also effectively oxidized the dye solutions. However, this method required initial pH adjustment to between 2 and 4, before the electrochemical step, making the process unattractive.

The other method tested using ion-exchanged zeolites together with hydrogen peroxide, was a very attractive process. Several synthetic zeolites and a natural zeolite were ion-exchanged with different cations, e.g., Fe(II), Fe(III), Cu(II), Zn(II), Mn(II) and Ni(II). Out of the synthetic zeolites, Fe(II) exchanged ZSM-5 was superior. Clinoptilolite, a natural zeolite, ion-exchanged with Fe(II) was found to be even more effective than Fe(II)-exchanged ZSM-5. Since the catalytic Fe(II) sites are bound to the zeolite structure, no sludges are formed and the cations released to the solution during organometallic dye degradation were found to absorbed by the zeolites. Thus, toxic metals like copper or cobalt released during dye degradation can be easily recovered using this process. Similarly, the process is amenable to scale-up as packed columns of Fe(II)-exchanged zeolites can be used for waste oxidation. Similarly, the toxic metals ion-exchanged onto zeolites can be easily leached out using dilute acids. In addition, it was also found that spent zeolite columns loaded with organic dyes can be regenerated by using 30% hydrogen peroxide solutions. This allows the effective regeneration of the columns.

The hydrogen peroxide decays to oxygen and water, so the entire system is environmentally friendly. Zeolites are non-toxic aluminosilicates and pose no disposal problems. Natural zeolites and the chemicals required (hydrogen peroxide and ferrous sulfate) are inexpensive making the process economical. All these advantages makes this advanced non-photoassisted catalytic oxidation process using Fe(II)-exchanged natural zeolites, a very attractive process for a variety of applications in environmental remediation. The feasibility of this process has been amply demonstrated to recommend further studies under a possible follow-on Phase II project.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1194/report/F

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Type: SBIR PHASE I
Status: Completed
Reports: Final

New Environmentally Benign Heteropolymolybdate Conversion Coatings for Aluminum Alloys

EPA Contract Number: 68D98127
Title: New Environmentally Benign Heteropolymolybdate Conversion Coatings for Aluminum Alloys
Investigators: Zoran Minevski
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1998 through March 1, 1999
Project Amount: $70,000
Research Category: SBIR - Pollution Prevention

Description:

Chemical conversion coatings to provide corrosion resistance to aluminum and aluminum alloys are based on the use of chromates. Because environmental regulations and standards for numerous materials and products throughout the industrial market are becoming more focused on environmental and human impact issues, chromate use has become a regulation target. Chromate is both toxic and carcinogenic under certain conditions; thus, its future, on an industry basis, is becoming more strictly regulated.

Lynntech, Inc., has successfully completed preliminary tests on a new heteropolymolybdate-based conversion coating which has two highly important commercial potential features: (a) initial tests have shown corrosion resistance features equal to that of chromate, and (b) heteropolymolybdate formulations are environmentally benign and have a low potential for toxic impact. The key to this project is the use of heteropolymolybdates, where the primary effect of the hetero atom (Mn, V, Ce, Si) is an effective transformation of Mo(III) and Mo(IV) to stable Mo(V) and Mo(VI); therefore, enhancing the formation of conversion coatings on aluminum alloys. The results of the Phase I research project will provide corrosion protective conversion coating formulations for a range of aluminum alloys. Those coatings will be inexpensive and environmentally beneficial.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1709/report/F

Type: SBIR PHASE I
Status: Completed
Reports: Final

Compact, Continuous Monitoring for Volatile Organic Compounds

EPA Contract Number: 68D98133
Title: Compact, Continuous Monitoring for Volatile Organic Compounds
Investigators: David Christian Hovde
Small Business: Southwest Sciences Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1998 through March 1, 1999
Project Amount: $70,000
Research Category: SBIR - Monitoring and Analysis

Description:

Improved methods for onsite measurement of multiple volatile organic compounds are needed for process control, monitoring, and remediation. This Phase I SBIR project sets forth an optical measurement method that meets these needs. The proposed approach provides an instantaneous measure of individual compounds with extremely low cross- sensitivity and minimal matrix effects. This high degree of selectivity is especially important in monitoring industrial processes that involve hazardous air pollutants such as benzene. The approach combines a rugged light source and inexpensive, high- performance digital electronics to achieve a compact, cost-effective instrument. Fiber optic compatibility results in flexible instrument location and permits multiplexing among several nearby measurement sites.

Summary/Accomplishments:

This Phase I investigation explored spectroscopic methods for measuring trace concentrations of specific volatile organic compounds (VOCs). The goal of the research was to demonstrate an accurate method for measuring gaseous VOC concentrations in industrial settings using the same diode laser based technology which has been successfully applied to the detection of simpler molecules. The research program sought to determine the typical spectral features of VOCs, learn how to exploit these features to permit measurement of the concentration of particular VOCs, and devise data processing methods to maximize the information extracted from a spectrum. Specific tasks of the investigation included

1. Fundamental spectroscopy of selected VOCs using the high resolution Fourier transform instrument at the Ohio State University,

2. Near infrared diode laser spectroscopy of a model compound,

3. Digital processing of the laser spectra to extract estimates of the concentration of VOCs present.

These tasks were all successfully completed. The fundamental spectroscopy task obtained spectra at high resolution over the wavelength range from 3,000 to 7,900 cm-1. This permitted the strength and shape of the spectroscopic features to be evaluated. Every compound has a region of relatively strong absorption.

A rapid laser-based technique for measuring VOC concentration was demonstrated. Based on wavelength modulation, the technique was easily implemented using commercial off the shelf electronics. This technique was shown to have a sensitivity for the model compound of at least 12 parts per million and likely much better. Improvements to achieve still lower detection limits are outlined. The magnitude of the signal was accurately predicted from the Fourier transform spectrum. This gives confidence that the other compounds can be measured with their expected sensitivities.

An algorithm was invented which deals with the most common source of error in diode laser measurements within the framework of least squares theory. As proof of the effectiveness of the new algorithm, the stability of a laser measurement was shown to increase, resulting in longer useful signal averaging times and at least 10% lower noise levels.

This VOC research has broad applications in industrial measurements of VOCs as toxic gases at chemical plants, as pollutants from smokestacks, and in process gas control applications. The novel data processing algorithm has applications to small molecule detection as well.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1269/report/F

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Type: SBIR PHASE I
Status: Completed
Reports: 1999, Final

High-Performance, Low-Global-Warming Refrigerant for Domestic Refrigerators

EPA Contract Number: 68D98147
Title: High-Performance, Low-Global-Warming Refrigerant for Domestic Refrigerators
Investigators: Jonathan S. Nimitz
Small Business: Environmental Technology and Education Center Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1998 through March 1, 1999
Project Amount: $69,898
Research Category: SBIR - Pollution Prevention

Description:

Two new nonflammable, nontoxic, nonfractionating, environmentally safe, medium- pressure refrigerant blends with performance superior to CFCs, HCFCs, HFCs, and other alternatives have been discovered. These refrigerants, called Ikon A and B, have attractive physical properties, zero ozone depleting potential, and very low global warming potential and total equivalent warming impacts (TEWI). Both appear superior in performance and environmental properties to any other alternatives available. They have been shown to have high thermal stability, low toxicity, and good compatibility with commercial materials. They could eliminate the need for the global warming refrigerant R-134a and the ozone-depleting refrigerant R-12 and allow improved energy efficiency, which will reduce fuel consumption and the amounts of CO_2 produced. Although they appear suitable to replace R-134a and R-12 in domestic refrigerators, Ikon A and B have not yet been tested for this use. Tests by the EPA, Dole Foods, and Environmental Technology and Education Center (ETEC) have shown that Ikon refrigerants have 10-30% better energy efficiency than current refrigerants. In Phase I the technology will be reviewed, a refrigerator will be instrumented, baseline performance data with R-134a and R-12 will be collected, performance data with Ikon refrigerants will be obtained, and TEWIs will be calculated.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1629/report/1999

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1629/report/F

Type: SBIR PHASE I
Status: Completed
Reports: Final

Recycling Process for Poultry Litter

EPA Contract Number: 68D99017
Title: Recycling Process for Poultry Litter
Investigators: Ronald E. Allred
Small Business: Adherent Technologies Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1999 through March 1, 2000
Project Amount: $69,988
Research Category: SBIR - Hazardous and Solid Waste

Description:

A low-temperature, catalytic tertiary conversion process for recycling organic materials is proposed for application to turkey litter and other animal waste. This platform technology delivers rapid capture of valuable nutrient resources in a closed, nonpolluting system and can maintain the physical properties of materials treated or reduce them into a fine, dense ash. Current environmental problems associated with disposal of poultry and swine wastes provide excellent opportunities for use of this recycling technology to minimize the volume of litter, manure, and mortalities requiring disposal; sterilize litter material for reuse in multiple rotations; and reclaim valuable nutrient and mineral resources using a safe, closed system.

Recycling reactors based on this technology are easily adapted for permanent on-farm installation as well as truck-mounted portable units. This technology should provide economically viable treatment options for poultry and swine waste streams even before the values of reclaimed resources are considered. Successful deployment of this technology to poultry and livestock producers will result in increased food and worker safety, reduced risk of environmental contamination, enhanced producer profit margins, and increased rural property values. Related technologies are being commercialized for recycling scrap plastics and electronic, aircraft, and automotive parts.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1329/report/F

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

The Reduction of Mercury and Sulfur Dioxide Emissions From Coal-Fired Power Plants

EPA Contract Number: 68D99055
Title: The Reduction of Mercury and Sulfur Dioxide Emissions From Coal-Fired Power Plants
Investigators: Paul Sylvester
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1999 through March 1, 2000
Project Amount: $70,000
Research Category: SBIR - Air

Description:

The EPA has concluded that there is a plausible link between anthropogenic mercury emissions and mercury accumulations in fish. Hence, regulations are being enacted to reduce the levels of mercury emitted to the environment. Coal-fired utility boilers are the largest single source of anthropogenic mercury emissions in the United States, and no current technologies have been shown to be cost-effective in reducing the amount of mercury released into the environment. New clay-based materials have been devised to remove mercury from the gas phase. Advantages of these materials include low toxicity, high mercury capacity, low cost, compatibility with current systems, immobilization of the absorbed mercury, and the ability to remove mercury regardless of speciation.

Phase I will evaluate the synthesis, kinetics of mercury absorption, and the capacity of these materials and will study the absorption of sulfur dioxide. Pilot plant testing using a coal combustor will be performed in later phases of the project. Also, it will be determined whether the materials should be used as a final stage filter or injected into the flue gas as a dry powder.

The primary use will be for the removal of mercury from coal-fired utility plant and municipal waste incinerator emissions to reduce emission levels to meet new and future EPA regulations. This is expected to cause a major reduction of anthropogenic mercury emissions in the United States and worldwide. Capital costs are predicted to be minimal, and when used in conjunction with a wet flue gas desulfurization system, mercury discharges are expected to be reduced by 90 percent or more. These materials also could be used as mercury traps to allow the preconcentration of environmental samples to allow accurate determinations of ultralow levels of mercury.

Type: SBIR PHASE I
Status: Completed
Reports: Final

Portable Methane Flux Meter

EPA Contract Number: 68D99069
Title: Portable Methane Flux Meter
Investigators: David Christian Hovde
Small Business: Southwest Sciences Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1999 through March 1, 2000
Project Amount: $70,000
Research Category: SBIR - Air

Description:

This Phase I project will investigate achieving a low power, portable system for measuring methane concentrations and fluxes. The system will combine diode laser-based trace gas concentration measurements with rapid wind speed measurements to determine fluxes using eddy correlation. By employing advanced diode laser modulation methods with signal processing electronics developed for the communications industry, a low-cost, lightweight system can be developed. Such a system can be deployed in remote locations and operated for extended periods using electricity generated by wind, solar panels, or traditional gasoline generators.

The result of the research will be a demonstration of a novel modulation and signal recovery method and an estimate of the cost, weight, and electrical consumption of a system based on this technology. In Phase II, extensive field measurements will be performed.

The proposed research has applications in trace gas measurement instrumentation for the atmospheric research community, portable leak detectors for the natural gas pipeline system, and the detection of toxic or hazardous gases at chemical plants and refineries.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1288/report/F

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Novel Cleanup of Metal Working Wastewaters

EPA Contract Number: 68D00030
Title: Novel Cleanup of Metal Working Wastewaters
Investigators: Scott R. Taylor
Small Business: S.R. Taylor and Associates
516 SW Kaw
Bartlesville, OK 74003
(918) 337-0264
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: August 1, 1990 through February 1, 1991
Project Amount: $49,550
Research Category: SBIR - Water

Description:

Current metal cutting and finishing operations use skim- ming and filtration to try to separate wastes from their water based cutting fluids. The residual liquid from the filtration consists of ultrafine metal particles containing hazardous heavy metals like lead, zinc, and cadmium and a tightly emulsified oil-in-water phase. This sludge is not amenable to further treatment and must be hauled off as hazardous waste. Also, at this level of cleaning, the water phase is not clean enough to discharge and must be controlled within the plant. Furthermore, this liquid does not have the same properties as freshly prepared solutions. Hence, the cost of this problem to industry is much more than the apparent disposal cost.

Ultrasonic coalescence can promote rapid agglomeration of particulate in a fluid. Once the particles are agglomerated, they can be efficiently separated by centrifugal or gravity separation. S. R. Taylor and Associates propose to use its combined experience with ultrasonics and multiphase coalescence processing to develop ultrasonic coalescence for separating oil and ultrafine metal particles from metal working wastewaters, to determine the appro- priate operating conditions for successful coalescence, and to use this method to regenerate typical metal cutting fluids.

Phase I studies will focus on demonstration of feasibility and preliminary design studies providing the support for the Phase II prototype development and actual continuous flow testing.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Reclamation of Soils and Soil Leachates Contaminated with Heavy Metals

EPA Contract Number: 68D00055
Title: Reclamation of Soils and Soil Leachates Contaminated with Heavy Metals
Investigators: James Michael Hosea
Small Business: Bio-Recovery Systems Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 1990 through April 1, 1991
Project Amount: $49,924
Research Category: SBIR - Hazardous and Solid Waste

Description:

Soil washing or flushing has been shown to be an effective method for removing heavy metals from metal-contaminated soils at Superfund sites. Sandy soils can often be washed with water to mobilize metal ions in an aqueous phase, but for clay soils or soils which contain insoluble metal com- pounds, e.g., lead sulfate, other additives such as chelating agents (EDTA) are used to effect transfer of metal ions to the aqueous phase. EDTA, however, complexes with in- nocuous metal ions (calcium, magnesium, iron), and EDTA- heavy metal complexes are difficult to remove from the aqueous phase. Bio-Recovery Systems has developed a proprietary process to circumvent these difficulties using a chelating agent (MLA) which has little or no affinity for innocuous metal ions and which has a higher affinity for many toxic metal ions than does EDTA. Furthermore, the heavy metal-MLA complexes can be removed from the aqueous phase by sorption on AlgaSORBTM resins, a proprietary biomass developed by Bio-Recovery. Thus, the use of MLA as a soil washing agent and the use of AlgaSORBTM will be tested to recover the MLA metal ion complexes in order to ascertain if this approach will yield a more cost effective treatment for metal-contaminated soils at Superfund sites than current methods.

Since simple water washes have been effective for mobilization of metals in sandy soils, solutions resulting from simple water washing will be treated with AlgaSORBTM to determine metal removal efficiency.

Type: SBIR PHASE I
Status: Completed
Reports: Final

Novel Polymers With Immobilized Antimicrobial Enzymes for Disinfection

EPA Contract Number: 68D00246
Title: Novel Polymers With Immobilized Antimicrobial Enzymes for Disinfection
Investigators: G. Duncan Hitchens
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 2000 through March 1, 2001
Project Amount: $70,000
Research Category: SBIR - Pollution Prevention

Description:

The Phase I objective is to investigate the use of novel polymer with immobilized antimicrobial enzymes as all natural, nonreactive, and nontoxic disinfecting materials. The resurgence of infectious diseases in the United States and internationally has created an unprecedented level of awareness of the hazards of bacteria and other microbes. These diseases derive from declining effectiveness of antibiotics, appearance and spread of new pathogens, disposal of human wastes, hospital-related infections, and food-related infections. As a result of increasing demand, a large number of biocides have flooded the market. However, most of these are chemical-based biocides. Biocides like silver, quaternary ammonium salts, phosphonium salts, sulfur compounds, halogenated compounds, and oxidizing chemicals pose a health hazard due to inherited toxicity of these chemicals. Superior methods for control of microbial growth are thus required to contain spread of disease and discomfort associated with microbial infections. Potential areas of application of these polymers include: prevention of biofilm formation, treatment of hydroponic solutions, disinfection of drinking water, enhanced microbial control for hospitals, and control of airborne pathogens in indoor environments. Preliminary experimentation has demonstrated destruction of gram positive and gram negative bacteria in aqueous growth media using immobilized antimicrobial enzymes. The material for improved control of the growth of microorganisms that originate from this work can be applied in a broad variety of commercial applications, including: food processing and preparation, biomedical applications, water purification, and general household hygiene.

Development of antimicrobial polymers have the potential to offer a safe and natural alternative for disinfection. The polymers will be useful for producing antimicrobial catheters, gloves, clothing, food preparation surfaces, food packaging materials, water disinfection, and an antimicrobial coating to protect against microbial colonization of surfaces.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1744/report/F

Type: SBIR PHASE I
Status: Completed
Reports: Final

A High Efficiency, Extremely Low Emission Internal Combustion Engine With On-Demand Generation of Hydrogen-Rich Gas by a Plasmatron

EPA Contract Number: 68D00247
Title: A High Efficiency, Extremely Low Emission Internal Combustion Engine With On-Demand Generation of Hydrogen-Rich Gas by a Plasmatron
Investigators: Craig C. Andrews
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 2000 through March 1, 2001
Project Amount: $70,000
Research Category: SBIR - Pollution Prevention

Description:

The Phase I objective is to demonstrate the feasibility of the on-board generation of hydrogen on demand from hydrocarbon fuels by a plasmatron to increase the efficiency of internal combustion engines and significantly reduce emissions. It is proposed to make the plasmatron an integral part of the engine, thus recovering nearly all of the energy released during the thermally initiated conversion of a hydrocarbon fuel to hydrogen in utilizing a partial oxidation process. The integrated plasmatron approach to obtaining hydrogen from hydrocarbon fuel has a number of advantages when compared to the more conventional catalytic partial oxidation and steam reforming processes. The proposed concept will be tested by incorporating a suitable plasmatron into the small diesel engine. Engine emissions and system efficiency will be measured before and after the modification. Data will be collected to determine the best system parameters to achieve maximum pollutant reduction at the highest engine efficiency possible.

Increased fuel efficiency directly benefits engine operators and the national economy. The automobile industry could meet future U.S. Environmental Protection Agency clean air standards. Reduced environmental pollution levels translate into economic and societal benefits to the Nation; such as lower incidence of diseases in humans and slower deterioration of buildings and other infrastructures.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1706/report/F

Type: SBIR PHASE I
Status: Completed
Reports: 2001, Final

A Novel Method for Converting a Negative Value Waste Into a Commodity Chemical

EPA Contract Number: 68D00248
Title: A Novel Method for Converting a Negative Value Waste Into a Commodity Chemical
Investigators: Adrian J. Denvir
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 2000 through March 1, 2001
Project Amount: $70,000
Research Category: SBIR - Hazardous and Solid Waste

Description:

It is estimated that there are approximately 300 million tires discarded each year in the United States, and this is on top of the 800 million scrap tires that reside in landfills and tire dumps throughout the country. About 180 million of the 300 million tires discarded each year are recycled, 130 million are burned as fuel for power plants and cement kilns, 15 million are retreaded and resold, and the remainder are ground into crumb for polymer filling. The remaining 120 million scrap tires are discarded (legally or illegally) in landfills or tire dumps. Current tire reuse technologies offer a considerable opportunity to generate valuable materials from what is essentially worthless scrap. There are significant market barriers preventing these technologies from reaching their economic potential.

Considering all of the potential markets for crumb rubber as a polymer filler, the one with the greatest potential is the production of rubber pavements. There are 27 million tons of asphalt used in building and maintaining roads each year in the United States. Lynntech, Inc., has developed an innovative ozonation process that alters the physical nature of the crumb rubber in two ways. The rubber is chemically "devulcanized," generating cleavage products that are free from the interference of the sulfur-carbon bonds in the original rubber state, and secondly, there is oxygen functionality added to the cleavage products. The overall result of this treatment is a product that is easy to mix with asphalt, with greater surface area for better contact, and functional groups for improved bonding. Experts believe that an asphalt pavement made using the Lynntech modified crumb rubber would be of better quality than a pavement made with ordinary crumb rubber.

The Phase I objective is to develop a low-temperature process for the production of surface modified crumb rubber. The system will be environmentally friendly and have low treatment costs, thus making the process economically sound. The surface modified crumb rubber, which is generated in the process, will have applications in many different markets. The process has the advantage of removing the problematic tire waste from landfills and generating a material with considerable market value. Inquiries into crumb rubber prices suggested that the ozonated crumb rubber could be sold for $0.25 per lb. In the polymer feed market, this would generate a net income of $30 million per year.

Progress and Final Reports:

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1305/report/2001

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1305/report/F

Type: SBIR PHASE I
Status: Completed
Reports: 2001, Final

A New Microfluidic System for the Determination of *Cryptosporidium* Oocysts in Water

EPA Contract Number: 68D00249
Title: A New Microfluidic System for the Determination of *Cryptosporidium* Oocysts in Water
Investigators: Dalibor Hodko
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 2000 through March 1, 2001
Project Amount: $70,000
Research Category: SBIR - Monitoring and Analysis

Description:

Waterborne infectious disease outbreaks have been attributed to a variety of pathogenic bacteria, parasites, and viruses. *Cryptosporidium* outbreaks have been reported less frequently, but the number of cases associated with an outbreak has been much larger. Such outbreaks prompted the U.S. Environmental Protection Agency (EPA) to establish the Information Collection Rule (ICR), which requires that all large public water systems routinely conduct microbiological monitoring of raw and finished waters. Currently available methods for detection of *Cryptosporidium* oocyst and Giardia cysts, the ICR method and Method 1622, yield low oocysts and/or cysts recovery, cannot be performed in the field, do not distinguish between live and dead protozoa, and need highly trained professionals to accurately perform the analysis. The accuracy of these fluorescent microscopically based methods is strongly affected by nonspecific fluorescence, other organisms, the presence of a chlorine compound, and other physical conditions of the sample.

Method:

The new method proposed is based on two innovations, one for the separation of live *Cryptosporidium* oocysts from the water sample and the other for the detection of *Cryptosporidium* DNA amplicons using a new detection method of polymerase chain reaction (PCR) amplified DNA. The system involves the development of a microfluidic analyzer that will allow highly specific and sensitive detection of *Cryptosporidium* and other microogranisms and performance of the analysis in the field. The main features of the analyzer include direct interfacing between large sample volume and a microliter volume used in the microfluidic detection channel, on-chip cell lysis, amplification of DNA through rapid thermal cycling, and nonfluorescence on-ship detection of DNA amplicons. A fully developed system should provide unparalleled sensitivity and selectivity for detecting *Cryptosporidium* oocyst and will not require highly trained personnel for its performance in the field.

Expected Results:

The proposed microfluidic system will find a large number of applications in future microfluidics-based instrumentation for integration of basic components for concentration, transport, and detection of biologic and inorganic particles in liquid samples. Potential commercial applications of the developed instrument will include monitoring of microorganisms in the field or on production lines in the food, chemical, pharmaceutical, and biotechnology industries.

Progress and Final Reports:

2001 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1286/report/2001

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1286/report/F

Type: SBIR PHASE I
Status: Completed
Reports: Final

PheroJet Traps for Areawide Integrated Pest Management

EPA Contract Number: 68D00251
Title: PheroJet Traps for Areawide Integrated Pest Management
Investigators: Donald J. Hayes
Small Business: MicroFab Technologies Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 2000 through March 1, 2001
Project Amount: $70,000
Research Category: SBIR - Pollution Prevention

Description:

MicroFab Technologies will develop automated codling moth pheromone traps based on state-of-the-art fluid microdispensing, electronic imaging/counting, and wireless data transfer technologies. Because the traps will be automated and able to communicate in real time, they can be integrated easily into a computer controlled system for areawide integrated pest management (IPM). Successful development of commercial PheroJet traps would lead to a significant decrease in the use of pesticides.

The automated traps will utilize: ink-jet printing technology for control of pheromone dispensing (PheroJet) in picoliter quantities with microsecond temporal resolution; electro-optic detection; and wireless communications for low cost, instantaneous data gathering and transfer from distributed monitoring systems to a centralized location.

The traps will be developed specifically for codling moth, but, with some modifications, would be effective for monitoring other moths such as the pink bollworm, bollworm, budmoth, and many others. The detection device, a key component of this type of trap, will be designed to discriminate other species that may enter pheromone baited traps and thus record only the target pest.

During Phase I, MicroFab Technologies will design, fabricate, and test prototype PheroJet moth traps that contain both the pheromone dispensing system and a moth detection/counting system. In Phase II, the wireless telemetry system will be added to the prototype traps and field testing will be expanded.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1730/report/F

Type: SBIR PHASE I
Status: Completed
Reports: Final

High Performance, Zero ODP Halon 1301 Replacement

EPA Contract Number: 68D00255
Title: High Performance, Zero ODP Halon 1301 Replacement
Investigators: Jonathan S. Nimitz,
Small Business: Nimitz Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: September 1, 2000 through March 1, 2001
Project Amount: $70,000
Research Category: SBIR - Pollution Prevention

Description:

A new zero-ozone depleting potential (ODP), high-performance, clean fire and explosion suppression agent has been discovered. This agent is more effective and less expensive than Halon 1301 and requires about 50 percent less weight and volume. It appears that it can be used in the same delivery systems. Also, it will allow the use of smaller, lighter extinguishing systems for applications such as military and civilian aircraft in the future, thereby saving space and fuel. The Phase I objective is to determine the cup-burner extinguishment concentrations for the agent with seven common fuels. These fuels are heptane, jet fuels JP-4 and JP-5, diesel No. 2, hydraulic fluid No.1, turbo hydraulic oil 2380, and unleaded gasoline oxygenated with 8 percent ethanol. Chamber extinguishment tests will be conducted to determine the effectiveness of the agent at a larger scale. Fractionation tests will be conducted to determine how concentrations vary if a leak develops.

The Phase I and II efforts will demonstrate and validate a clean, high-performance, environmentally friendly fire and explosion suppression agent. The primary objective of this project is to obtain sufficient quantity and quality of data to support commercial introduction of the agent. Phase II of this effort will provide performance data at a larger scale under a variety of scenarios as well as data on compatibility, decomposition products in flames, thermal stability, and equipment requirements. Phase II will prepare the product for commercialization.

Potential commercial applications include all normally unoccupied spaces where weight and volume considerations are important. This includes aircrafts, ships, telecommunications equipment, and floating roofs for oil storage. The market for clean firefighting agents worldwide is estimated to be 5 million pounds per year. An estimated eventual 50 percent market share would be 2.5 million pounds per year, or $50 million per year at $20 per pound. The market for retrofit of existing Halon 1301 systems would perhaps double the base market, giving a total market of about $100 million per year.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1745/report/F

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Novel Method for Ferrate Production

EPA Contract Number: 68D01027
Title: Novel Method for Ferrate Production
Investigators: Adrian J. Denvir
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: April 1, 2001 through September 1, 2001
Project Amount: $70,000
Research Category: SBIR - Pollution Prevention

Description:

This Phase I project is concerned with the development of a simple, cost-effective, environmentally friendly process for the production of potassium ferrate.

Method:

Lynntech, Inc.'s proposed method can be readily scaled up for the production of industrial quantities of this extremely useful oxidant. Ferrate is an environmentally friendly oxidant that represents an ideal substitute for other oxidants, particularly chromate and chlorine, which are of environmental concern. Ferrate has the benefit of being "environmentally safe" because the iron product is simply ferric oxide (i.e., rust). Although the oxidation reactions with ferrate appear to be similar to those known for MnO_4^- and $CrO_4^=$, ferrate exhibits greater functional group selectivity in its oxidations and generally reacts to produce a cleaner reaction product.

Expected Results:

The use of ferrate, $FeO_4^=$, promises a safe, convenient, versatile, and cost-effective alternative to current approaches for water and wastewater treatment. Ferrate is a useful alternative to chlorine in water disinfection because toxic chlorinated byproducts are not formed. The endproduct formed using ferrate for oxidation reactions is $Fe(OH)_3^-$, which is a precipitate that is well

well known for adsorbing heavy metals from waste solutions as well as various industrial applications.

Type: SBIR PHASE I
Status: Completed
Reports: Final

Hand-Held Fluorometer Using SELEX DNA Aptamer Strip Assays To Detect *Cryptosporidium* and *Encephalitozoon*

EPA Contract Number: 68D01044
Title: Hand-Held Fluorometer Using SELEX DNA Aptamer Strip Assays To Detect *Cryptosporidium* and *Encephalitozoon*
Investigators: Bruno, John G.
Small Business: Systems and Processes Engineering Corporation
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: April 1, 2001 through September 1, 2001
Project Amount: $70,000
Research Category: SBIR - Monitoring and Analysis

Description:

Systems & Processes Engineering Corporation (SPEC) proposes to develop receptors composed of DNA oligomers ("aptamers") from a combinatorial library for binding and detecting Cryptosporidium parvum oocysts and three species of Encephalitozoon spores. Aptamers will be generated by the Systematic Evolution of Ligands by EXponential enrichment (SELEX) combinatorial chemistry technique. SELEX aptamers offer several major advantages over antibody technology; most notably eliminating the use of animal hosts, resulting in reduced cost, as well as higher affinity and specificity to target pathogens of interest.

The Phase I objective is to generate a set of specific DNA aptamers to bind and detect oocysts and spores. Aptamer assay development will be designed for use on a magnetic bead-based cartridge for enhanced sample separation into various aptamer capture regions with subsequent detection using SPEC's proprietary hand-held fluorometer. In Phase II, SPEC will clone and sequence the aptamers and optimize assays for field and home use. In addition, SPEC will add the ability to transfer data from the fluorescence reader at remote locations to a Web site either by hardwire or wireless pager.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1244/report/F

150

Type: SBIR PHASE I
Status: Completed
Reports: Final

Development and Preliminary Validation of a Rapid Progestin-Based Endocrine Disruption Screening Assay

EPA Contract Number: 68D02023
Title: Development and Preliminary Validation of a Rapid Progestin-Based Endocrine Disruption Screening Assay
Investigators: Douglas J. Fort
Small Business: Fort Environmental Laboratories Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: April 1, 2002 through September 1, 2002
Project Amount: $70,000
Research Category: Monitoring and Measurement Technologies

Description:

Concerns regarding the presence of endocrine disruptors in food, water, or other environmental media as well as concerns about the potential risk they pose to humans and wildlife have been growing in recent years. Passage in 1996 of the Food Quality Protection Act and Amendments to the Safe Drinking Water Act reflected these concerns and required the U.S. Environmental Protection Agency to develop a screening program, using appropriate validated test systems and other scientifically relevant information, to determine whether certain substances may have an endocrine effect in wildlife and humans. The proposed work will result in the validation of an assay that tests substances that might disturb reproductive and developmental processes in animals by interfering with the endocrine system. The primary goal of the proposed research is to validate and commercialize the Xenopus laevis oocyte maturation germinal vesicle breakdown (GVBD) model as a system for the rapid evaluation of endocrine-disrupting chemicals (EDCs) found in the workplace or the environment. Specifically, Fort Environmental Laboratories, Inc., will validate and standardize a 24-hour X. laevis assay designed to evaluate progestin-active or antiprogestin EDCs in vitro by conducting an interlaboratory validation study with a series of known mammalian EDCs, compounds found to be inactive, and chemicals with unknown activity. Because none of the currently developed EDC screening systems are capable of specifically screening for progesterone-active EDCs, the successful completion of the in vitro oocyte GVBD model development will provide the scientific community with a nonmammalian, cost-effective, rapid, and reliable method of prescreening EDCs. The ability to rapidly and cost effectively screen for and evaluate the mechanisms of EDCs is an attractive alternative to the current laborious and expensive testing systems used today. Increasing concern over the widespread finding of EDCs in the environment has dramatically increased the need for standardized assays, such as the X. laevis GVBD model, because few other progestin/antiprogestin-based in vitro assays are available today.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5079/report/F

Type: SBIR PHASE I
Status: Completed
Reports: Final

A Universal Technique for Antimicrobial Surface Preparation Using Quaternary Ammonium-Functionalized Dendrimers

EPA Contract Number: 68D02030
Title: A Universal Technique for Antimicrobial Surface Preparation Using Quaternary Ammonium-Functionalized Dendrimers
Investigators: Wendy E. Krause
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: April 1, 2002 through September 1, 2002
Project Amount: $70,000
Research Category: SBIR - Pollution Prevention

Description:

A novel, environmentally benign antimicrobial surface modification based on immobilized quaternary ammonium-functionalized dendrimers is proposed for the prevention of biofilm formation. Dendrimers are unique nanomaterials that have attracted attention as possible antimicrobial agents due to their compact structure, high local charge density of functional surface groups, unique carrier properties, and biofriendly nature. High local concentrations of active groups are extremely beneficial in terms of potency, reduced toxicity, and increased duration of action.

Lynntech, Inc., proposes to: (1) synthesize and characterize a novel series of quaternary ammonium-functionalized dendrimers; (2) evaluate their effectiveness as biocides; (3) develop a surface treatment that can immobilize the dendrimers, be covalently attached to a variety of polymers, and be formed on either or both the inner and outer surfaces of complex geometries; and (4) evaluate the physical and biocidal properties of the materials modified with the immobilized dendrimers. The many applications of this technology are what make it so attractive. Because the antimicrobial surface modification can be applied to a variety of plastics preformed into complex shapes, its use is virtually unlimited. Lynntech, Inc., envisions this technology being used: (1) for in situ soil and other monitors; (2) for dental and other water lines; (3) to form antimicrobial fabrics; (4) to treat medical devices; (5) to produce heavy-metal-free antifouling coatings; (6) in water filtration and other membranes; (7) for glove and respirator materials; and (8) in biowarfare defense. Many consumer products could result from this technology, especially in the medical and food and beverage preparation and packaging fields.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5088/report/F

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

SELEX DNA Aptamer Filter for Removal of Pesticides and Chloroaromatics

EPA Contract Number: 68D02033
Title: SELEX DNA Aptamer Filter for Removal of Pesticides and Chloroaromatics
Investigators: John G. Bruno
Small Business: OmniSite BioDiagnostics Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: April 1, 2002 through September 1, 2002
Project Amount: $69,992
Research Category: SBIR - Monitoring and Analysis

Description:

OmniSite BioDiagnostics, Inc. (OmniSite) proposes to develop artificial receptors composed of DNA oligomers (called "aptamers") for binding and removal of organophosphorous and chlorinated pesticides. Aptamers will be generated by the systematic evolution of ligands by exponential enrichment (SELEX) combinatorial chemistry technique. SELEX aptamers offer several major advantages over antibody technology; most notably eliminating the use of animal hosts, resulting in reduced cost and higher affinity and specificity to target pollutants of interest. In addition, SELEX DNA aptamers can be mass produced with relative ease compared to antibody production and purification. The antipesticide aptamers will be immobilized onto a column matrix and used for affinity filtration of drinking water.

In Phase I, OmniSite proposes to demonstrate the utility of column-immobilized DNA aptamers to bind and remove diazinon, malathion, and pentachlorophenol from contaminated water. In Phase II, OmniSite will expand its repertoire of antipesticide aptamers with an emphasis on selecting aptamers that bind common moieties of organophosphorous and chlorinated pesticides or chloroaromatic wood preservatives, so as to bind and remove the largest array of pesticides from drinking water. OmniSite also will clone and sequence the antipesticide aptamers and optimize water purification protocols using the aptamer column. This project has high commercialization potential, because water purification filters are common store items and the aptamer-columns could be produced at very low cost.

Type: SBIR PHASE I
Status: Project Period Concluded
Reports: No Reports Available Yet

Rapid, Specific, Sensor System for Pathogens in Water

EPA Contract Number: 68D02038
Title: Rapid, Specific, Sensor System for Pathogens in Water
Investigators: Tiernan, Timothy C.
Small Business: TPL Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: April 1, 2002 through September 1, 2002
Project Amount: $69,046
Research Category: SBIR - Monitoring and Analysis

Description:

There is an important need for a water-monitoring technology that is capable of detecting a wide range of microbial and viral pathogens and their toxins. TPL, Inc., proposes an instrument system that could be used both in the laboratory or in the field for analyzing water quality for a wide range of contaminants, including microbial pathogens, Cryptosporidium, and viral pathogens.

The sensor system will be based on new technology under development by TPL and its research partners at the University of New Mexico. That technology will use protein molecules as probes for microbial and viral targets. The protein molecules used provide the system with an extremely high level of specificity and sensitivity for the pathogens of interest.

The probe proteins will be covalently bound to a micromachined sensor (or array of sensors), making the sensor durable and reusable. During operation, a stream of water or a water sample will be introduced to a test chamber in the water analysis instrument, where the aqueous sample comes in direct contact with the sensor. The analysis system will perform the desired analysis and output data concerning the type and concentration of analyte (e.g., pathogen) detected. The system does not rely on delicate laser detection systems or low levels of fluorescent light. The sensor will utilize an extremely sensitive microelectronic gravimetric device, known as an acoustic plate mode (APM) device. The proposed sensor can measure surface adsorption in either liquid or gas phase with picogram sensitivity and millisecond response time. High-speed digitization and digital signal processing techniques will be used to deconvolute the data contained in the APM acoustic wave modes generated by the sensor.

APM devices can be used as the basis for sensors using many different types of probe molecules, including proteins. This will allow the sensor to be used for a wide range of pathogens in water, with rapid measurements of a number of different types of pathogens for online monitoring. In a summary printed in R&D Magazine, April 1999, the Business Communications Company forecasted that the market for biosensors is expected to increase to $1.68 billion in 2003, from $765 million in 1998. Existing markets for sensors are in the environmental, government, industrial, research, and medical sectors. The competing technology is based mainly on the detection of fluorescent light. Problems encountered with this technology include low flux of light, large volumes of expensive fluorescent molecules, and inefficiency in light transfer in a liquid medium. The proposed sensor does not rely on light transfer, and has higher intrinsic sensitivity than fluorescence and surface plasmon resonance.

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Type: SBIR PHASE I
Status: Ongoing
Reports: No Reports Available Yet

Novel Method for Ferrate Production

EPA Contract Number: 68D02054
Title: Novel Method for Ferrate Production
Investigators: Adrian J. Denvir
Small Business: Lynntech Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: June 1, 2002 through June 1, 2004
Project Amount: $225,000
Research Category:

Description:

New environmental regulations have identified many of the currently used oxidizing agents employed for industrial waste control, disinfection, and wastewater treatment as a caveat that must be addressed. Ferrate has potential for becoming the alternative of choice because of its aggressive oxidation properties and its negligible impact on the environment. However, there has been little industrial interest in ferrate because of the high cost of production. All known methods of ferrate synthesis are extremely expensive and hence, less effective oxidizing agents that are much more affordable to produce are commonly employed. During Phase I, Lynntech, Inc., developed an environmentally benign electrochemical process for the production of greater than 98 percent pure potassium ferrate that is at least one-tenth the cost of conventional methods. The most attractive features of this process are its reliance on low-cost starting materials—most of which are recyclable, and the elimination of expensive ion exchange membranes. Utilizing continuous magnetic separation of ferrate from the electrochemical cell ensures that this process is ideally suited for industrial use. In Phase II, Lynntech, Inc., proposes to optimize ferrate production and extraction to develop a continuous, online system for yearly production of up to 100 kg of high-purity product. This project involves a collaborative effort between Lynntech, Inc., and leading companies in the specialty chemicals industry to develop this innovative process of ferrate production for implementation in the commercial marketplace.

Widespread applications of oxidizing agents range from disinfection and sterilization to wastewater treatment and removal of hazardous waste materials as well as batteries and catalytic synthesis of explosives. However, many of the currently available oxidants are limited by the requirement of harmful starting materials or the generation of large volumes of negative-value byproducts. Ferrate has been shown to be effective in many of these applications, where the only byproduct of oxidation is environmentally benign rust. Lynntech, Inc., already has demonstrated the effectiveness of ferrate utilization in aluminum conversion coatings and nuclear waste remediation, which have combined markets in excess of $4 billion.

Type: SBIR PHASE I
Status: Ongoing
Reports: No Reports Available Yet

Subsurface Treatment for Arsenic Removal

EPA Contract Number: 68D02099
Title: Subsurface Treatment for Arsenic Removal
Investigators: Gregory P. Miller
Small Business: Daniel B. Stephens and Associates Inc.
EPA Contact: Manager, SBIR Program
Phase: I
Project Period: October 1, 2002 through July 31, 2003
Project Amount: $100,000
Research Category: SBIR - Water

Description:

Subsurface treatment for arsenic removal (STAR) is an innovative technology for treatment of arsenic in groundwater at the wellhead. The STAR technology can result in large cost savings when compared with conventional above-ground treatment methods. The goal is to create a subsurface biogeochemical barrier composed of reactive iron hydroxide minerals and iron bacteria within the aquifer surrounding a water-supply well. Following emplacement of the geochemical barrier, the well will yield water that will meet or exceed the arsenic drinking standard of 10 ppb.

The primary objectives of the Phase I research project are to: (1) demonstrate practical methods to achieve arsenic sequestration by increasing dissolved oxygen concentrations in the aquifer; and (2) develop diagnostic tools for assessing the performance and design of systems in varied hydrogeologic settings. The STAR technology stems from a baseline re-engineering of the proven and commercially available technology developed by Subsurface Technologies, Inc., for the in situ treatment of dissolved iron and manganese. This research project builds on what has been learned about subsurface iron and manganese removal and will adapt these principles to removal of dissolved arsenic. The two primary approaches for modification of geochemical conditions within an aquifer surrounding a water-supply well are: (1) creation of an oxidizing zone around the well through installation of a ring of air diffuser wells; and (2) alternating injection and withdrawal of oxygenated water at the production well itself (push-pull). During Phase I, Daniel B. Stephens & Associates, Inc., proposes to test the STAR technology at an existing water-supply well that currently exceeds the U.S. Environmental Protection Agency drinking water standard for arsenic. The proposed research plan addresses all relevant parameters, including geochemical reaction rates, aquifer heterogeneity, and groundwater residence time within the treatment zone.

Subsurface arsenic treatment offers significant advantages over conventional above-ground treatment technologies. Unlike conventional treatment plants, the capital costs associated with construction of above-ground facilities are not incurred. Furthermore, the proposed technology generates little or no waste. In contrast, conventional above-ground arsenic treatment plants continuously generate large volumes of waste sludge, brine, or spent treatment media requiring disposal. With the STAR technology, naturally occurring arsenic is left below ground in the aquifer, and no arsenic-bearing wastes are generated. Finally, unlike conventional treatment plants, the STAR technology does not require a skilled operator to maintain the system. The researchers believe these advantages will be particularly important for small community water systems providers.

Section 3.5

Listings 156 to 237

Early Competed Center

and

- Hazardous Substance Research Center Blue Pages

Type: EARLY COMPETED CENTER
Status: Completed
Reports: Final

Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics

EPA Grant Number: R825689C060
Subproject: this is subproject number 060 , established and managed by the Center Director under grant R825689 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: HSRC (1989) - Western HSRC
Center Director: Perry L. McCarty
Title: Enhancement of Biodegradation through the Use of Substituted Porphyrins to Treat Groundwater Contaminated with Halogenated Aliphatics
Investigators: Martin Reinhard, R. Tanner, Joseph Suflita, Kerry Sublette, Michael McInerney
Institution: Stanford University, Tulsa University, University of Oklahoma (Supported by the U.S. Department of Energy)
EPA Project Officer: Dale Manty
Project Period: January 1, 1993 through January 1, 1995
Project Amount: Refer to main center abstract for funding details.
Research Category: Hazardous Substances Research Centers

Description:

Both microbial and abiotic dehalogenation methods can be used to degrade chloroaliphatics. This project examined whether the two methods could be combined to obtain an overall superior process.

Dehalogenation by Metallocoenzymes and Zero-Valent Iron Powder (Stanford University):

Transformation by iron(0) powder was one of the abiotic dehalogenation methods that was evaluated. Iron(0) was chosen because it is reactive towards PCE as well as a range of substrates without the involvement of porphyrin. The reaction variables that were studied included temperature and pH. Once the PCE system is understood, other chlorinated substrates will be tested. Metallocoenzymes studied include Vitamin B12, which has a cobalt center, and hematin, which has an iron center. Soluble bulk reductants used were titanium (III) citrate, dithiothreitol, and cysteine. The most promising reaction systems will be further evaluated in combination with immobilized porphyrins (U. of Tulsa) and in biological cultures (U. of Oklahoma).

Transformation Reactions of Immobilized Porphyrins (Tulsa University):

After conducting batch experiments to evaluate reaction conditions with different reductants, fixed-bed reactors with immobilized cyanocobalamin were tested for their efficacy to remove PCE from water.

Effect of Reduced Porphyrins on Anaerobic Culture Performance (University of Oklahoma):

Whole cell suspensions of Desulfomonile tidjie, a PCE-dehalogenating bacterium, were incubated with and without vitamin B12 amendments under a range of conditions. Different sulfur reductants including cysteine, hydrogen sulfide and DTT were used.

Objective: This project is a collaborative effort of three laboratories, Stanford University, Tulsa University and the University of Oklahoma. The objectives are three fold: (1) assess whether porphyrin augmentation improves the performance of dehalogenating cultures, especially for the treatment of chlorinated ethanes and ethenes (University of Oklahoma), (2) assess whether immobilized porphyrins can be used for treating waste streams containing chlorinated ethanes and ethenes (Tulsa), and (3) evaluate different reductant/metallocoenzyme systems with respect to their ability to dehalogenate halogenated aliphatics.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2035/report/F

Type: EARLY COMPETED CENTER
Status: Completed
Reports: Final

Freshwater Bioturbators in Riverine Sediments as Enhancers of Contaminant Release

EPA Grant Number: R825513C027
Subproject: this is subproject number 027 , established and managed by the Center Director under grant R825513 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: HSRC (1989) - South and Southwest HSRC
Center Director: Danny D. Reible
Title: Freshwater Bioturbators in Riverine Sediments as Enhancers of Contaminant Release
Investigators: A. D. W. Acholonu, K. T. Valsaraj, Louis J. Thibodeaux
Institution: Louisiana State University - Baton Rouge, Alcorn State University
EPA Project Officer: Dale Manty
Project Period: January 1, 1995 through December 31, 1997
Research Category: Hazardous Substance Research Centers

Description:

The purpose of this study was to collect, identify, and catalog the benthic (bottom-dwelling) invertebrates in the Yazoo River and Yazoo Lake, and to compare the fauna from the two freshwater bodies. It was also conducted to enable us to find and select relevant bioturbators and use them to conduct flux measurement experiments. The general objective of the project is to contribute to knowledge about hazardous substances and how to get rid of them; to measure the magnitude of bioturbation by tubificid worms and other appropriate bioturbators in the laboratory in order to advance modeling of contaminant flux and ultimately understand its ecological implications.

Approach:

During the first year of this study, we surveyed the Yazoo River to find contaminated sediment sites; collect, identify, and catalog benthic fauna in the Yazoo River. Important bioturbators found were to be selected and transplanted into laboratory microcosm. Sediment contaminants were to be identified. Chemical analysis were to be performed and flux measurement experiments are expected to shed more light on physicochemical transport process. This study was directed toward quantifying the increased flux of hydrophobic organics from contaminated sediment due to bioturbation by freshwater oligochaetes found in the Yazoo River bed. The results of the flux measurement experiments are to shed more light on physicochemical transport process.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5633/report/F

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Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Urban Waste Management & Research Center (University of New Orleans)

EPA Grant Number: R825427
Center: Urban Waste Management and Research Center (University New Orleans)
Center Director: Kenneth McManis
Title: Urban Waste Management & Research Center (University of New Orleans)
Investigators: Kenneth McManis
Institution: University of New Orleans
EPA Project Officer: Bala S. Krishnan
Project Period: January 1, 1998 through September 30, 2003
Project Amount: $5,569,100
Research Category: Urban Waste Management & Research Center

Description:

The UNO Urban Waste Management and Research Center's (UWMRC or Center) mission addresses urban problems associated with municipal solid waste, wastewater, urban runoff, surface and ground water quality, and air quality. Its major goal is to provide an integrated multimedia waste management approach to the solution of urban environmental problems, and to advance the state of the art of urban waste management and pollution prevention through technology transfer.

The Center's research activities concentrate on urban environmental problems. The outreach activities of the Center are designed to promote community involvement and education on environmental issues and problems. Policy and technology transfer are key elements in the Center's programs. To that end the Center will conduct research projects relevant to urban needs. It will provide workshops, short courses, seminars and initiate training programs in urban waste management. The Center will also serve as a clearinghouse for technology and promote citizen involvement and education to help bridge the gap between governmental requirements and the needs of municipalities and industry. The Center will focus on research that will develop the technologies necessary to further this goal, and provide a source of trained graduate engineers and scientists. The Center will endeavor to become a catalyst in providing an environmental awareness for all of UNO's academic programs for the New Orleans metropolitan area, and for the nation.

Summary/Accomplishments:

The Center is committed to ensuring that the quality of the data generated from a project is specified and provides sufficient resources to enable the required level of quality assurance and quality control to be performed. To this end, the Center developed its Quality Management Plan which establishes the operational practices and procedures by which the Center implements its Quality System program. The QMP ensures that the quality of work and the data generated under projects supported by the Urban Waste Management and Research Center are within a stated level of confidence and do not exceed acceptable limits.

A five-year plan was developed to focus on issues concerning the urban environmental infrastructure and the urban watershed. The Center chose as its primary five year focus the development of a multi-year broad-based approach to address the problems associated with the environmental infrastructure located in the urban watershed. Secondary focus was given to areas of Water Quality, Urban Air Quality and Municipal Waste Management. The results of this multi year focus has a wide range of applicability in urban areas throughout the United States. The specific topics of study were chosen with regard to problems that were local in nature but national in scope.

The Center's research revolves around five themes: municipal solid waste, wastewater, urban runoff, surface and ground water quality, and air quality. Although these areas are important to the Center's mission, the Center, Environmental Protection Agency, the American Society of Civil Engineers and the Water Environment Federation have placed a primary emphasis on the need for research associated with urban environmental infrastructure while stressing a watershed based approach. Based on these national needs, the primary effort of the Center was be the development of a multi-year broad-based approach to address the problems associated with the environmental infrastructure located in the urban watershed. Secondary focus was given to areas of water quality, urban air quality and municipal waste management.

The eleven research projects conducted during the grant period are consistent with the Center's mission and goal to "addresses urban problems associated with municipal solid waste, wastewater, urban runoff, surface and ground water quality, and air quality; and to provide an integrated multimedia waste management approach to the solution of urban environmental problems, and to advance the state of the art of urban waste management and pollution prevention through technology transfer". The principal investigators have made a concerted effort to follow the mission and focus during the planning and implementation of their research.

In support of Improvements in Risk Assessment or Risk Management, the Center has provided an integrated multimedia waste management approach to the solution of urban environmental problems, and advanced the state of the art in urban waste management and pollution prevention through technology transfer.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5340/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Comprehensive Evaluation of The Dual Trickling Filter Solids Contact Process

EPA Grant Number: R825427C001
Subproject: this is subproject number 001 , established and managed by the Center Director under grant R825427 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Urban Waste Management and Research Center (University New Orleans)
Center Director: Kenneth McManis
Title: Comprehensive Evaluation of The Dual Trickling Filter Solids Contact Process
Investigators: Enrique J. La Motta, Juan Josse
Institution: University of New Orleans
EPA Project Officer: Bala S. Krishnan
Project Period: June 30, 1997 through May 31, 2000
Research Category: Urban Waste Management & Research Center

Description:

This project was developed using the full scale treatment plants located in Jefferson Parish, Louisiana, all of them using the trickling filter-solids contact process. A significant part of the project was devoted to a pilot plant investigation using a 2000 gpd pilot plant located at Marrero, LA. The main task was to try to find any relationship between common operating parameters, such as HRT, SRT, FM, hydraulic and organic loadings, and plant performance. No significant correlations could be established, and this led the investigators to conclude that plant performance is affected by other phenomena, such as biological flocculation, that plays a major role on both COD and SS removal.

The main objective of this project is to perform a comprehensive long-term evaluation of the performance of the Marrero, Bridge City, and Harvey wastewater treatment plants, in Jefferson Parish, Louisiana, based on an extended sampling and testing program. Additional objectives are to understand the effect of critical design parameters on the performance of the unit processes and the system as a whole, and to determine the optimum operating conditions.

Municipal Scale Treatment Plants: A sampling program of effluents of each unit process in the Marrero, Bridge City and Harvey full-scale plants was completed. The units sampled included bar rack, primary clarifier, trickling filter, solids contact basin and secondary clarifier. Grab samples were taken from January to July 1998. Between July and December 1998, 24-hour composite samples were taken. Automatic samplers were set up to pump every two hours, during a 24- hour period, into the composite sample tank. They were preserved with sulfuric acid to drop the pH to less than 2. Between January and June 1999, sludge samples were taken at the three plants. Waste activated sludge, primary sludge, sludge as it leaves the digesters, sludge cake and belt press filtrate were also sampled.

The parameters tested on the wastewater samples were total chemical oxygen demand (TCOD), dissolved chemical oxygen demand (DCOD), total suspended solids (TSS) and volatile suspended solids (VSS). Flow rates were also recorded at the time of sampling in the case of grab samples, and average daily flows in the case of composite samples. The results of the long-term testing were used to obtain average operating conditions of the unit processes at each plant. Based on these averages, spreadsheets were developed for each plant to calculate all operating parameters of each unit process. These values were compared with typical values published in the literature for the TF/SC process.

Pilot Plant Research: A TF/SC pilot plant was designed, constructed and erected at a location provided by the Marrero wastewater treatment plant, between the two primary clarifiers of the plant. The TF/SC pilot plant consists of an intermittent primary effluent feeding system, a trickling filter, an aerated solids contact tank, a flocculation tank, and a secondary clarifier, all with a design capacity of 2,000 gal/day. The pilot unit is fed by pumping the primary clarifier effluent from one of the primary tanks of the Marrero plant to an elevated 30-gallon constant-head tank. From this tank the water flows by gravity to the trickling filter distribution pipes. A timer-controlled valve opens and closes, so that the flow rate can be adjusted by changing the time that the valve is open. The trickling filter inlet distribution system consists of four properly leveled 2-inch diameter PVC pipes. These pipes are perforated on the sides and allow water overflow uniformly over the top of trickling filter media.

Conclusions:

The summary of findings are as follows: 1.Classical activated sludge design parameters like F/M ratio, SRT, MLSS, and organic loading on the TF have no significant effect on effluent quality of the dual TF/SC process. 2. Bioflocculation in the solids contact chamber and reflocculation in a center well flocculator in the final clarifier play a significant role in defining effluent quality. 3.Optimum performance of the TF/SC dual process relies on low TSS primary effluent, healthy TF and good flocculation in the SC chamber. 4.The velocity gradient in mechanical flocculation has no effect on effluent quality within the range studied of 15 to 45 s^{-1}. 5.Fine bubble diffusers in the SC chamber provide much better flocculation then coarse bubble diffusers. 6.Dissolved oxygen concentrations much lower than 1 mg/L deteriorate effluent quality.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5406/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Issues Involving the Vertical Expansion of Landfills

EPA Grant Number: R825427C002
Subproject: this is subproject number 002 , established and managed by the Center Director under grant R825427 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Urban Waste Management and Research Center (University New Orleans)
Center Director: Kenneth McManis
Title: Issues Involving the Vertical Expansion of Landfills
Investigators: Kenneth McManis, Mysore Nataraj, G. Boutwell, D. Debnath
Institution: University of New Orleans
EPA Project Officer: Bala S. Krishnan
Project Period: August 17, 1998 through April 30, 2002
Research Category: Urban Waste Management & Research Center

Description:

The proposal for the vertical expansion of landfills has raised serious concerns by many state and federal regulators regarding the stability of a high refuse fill under static and dynamic loading conditions, the contamination of ground water by liner/leachate collection system (L/LCS) damage and the increased potential for leachate generation. To address these issues, basic design parameters are necessary for the rational design of a vertical expansion. These include the parameters for: settlement, development of the load-leachate generation relationship, deformation strain, hydraulic conductivity, etc. Many of these parameters are not readily available nor routinely determined and have received only limited attention in the literature. To determine these parameters, this study included a field sampling and testing program, and a laboratory investigation.

The material tested included MSW that had been buried in-place and excavated, and that which was being delivered. The field investigation of the study included the in-place unit weight and moisture character of the waste material according to ASTM D5030. Bulk samples used for the tests were collected from the Tangipahoa Regional Solid Waste Facility near Amite, Louisiana, U.S.A. Two types of samples were collected from the landfill; one was compacted (excavated) MSW. This is old in-place MSW was mixed with daily soil cover. The second was a fresh (recently received) MSW. This MSW had been recently collected, delivered, and was ready to be placed in the landfill. The excavated MSW was collected from a depth of 0.9 to 1.2 m (4 to 4 ft) beneath the surface and consisted primarily of plastic bags and bottles, dirt, paper, wood, cloth etc. The gravimetric moisture content of the waste ranged from 15 to 19 percent. The field unit weight of the compacted waste was 12 kN/m^3 determined as per ASTM D5030. The fresh MSW was collected immediately after dumping at the landfill. It was similar to the compacted waste but with less dirt. The gravimetric moisture content of the waste ranged from 19 to 23 percent. The laboratory tests utilized these two sample types, i.e., 1) compacted in-place (excavated) municipal solid waste (MSW) and 2) fresh (recently received) municipal solid waste.

The settlement behavior, leachate release, and hydraulic conductivity that an existing landfill would be subjected to due to vertical expansion were simulated in a laboratory, large-scale testing program. The testing program was divided into three parts: 1) Liquid Release Tests (LRT), 2) Hydraulic Conductivity Tests (HCT) and a 3) settlement test on a saturated sample. The liquid release tests were conducted on both the excavated samples of MSW and the fresh MSW. Four of the leachate release tests were conducted on the excavated (older) MSW and three were conducted on the fresh (recent) MSW at various initial density levels. The settlement behavior of the unsaturated excavated MSW and fresh MSW were observed in the leachate release tests. Three hydraulic conductivity tests were performed on the excavated older MSW and the hydraulic conductivity values were measured at four different density levels for the same test. One settlement test was performed on the excavated MSW at 100 percent saturation. Two different types of PVC (Schedule 80) test chambers were fabricated for the tests.

The liquid release test (LRT) determines whether or not liquids will be released when the MSW is subjected to additional overburden pressures in a landfill. A saturated specimen of the excavated MSW was tested under incremental loading and extended load times to compare the settlement parameters with the values obtained from the liquid release tests, in which the values were unsaturated. The same test chamber and loading technique as used in the liquid release test was used in this test. The sample was saturated prior to loading with two way drainage existing. However, the incremental loading was applied over an extended period of time in order to establish the time-deformation character. Values for the compression index (Cc), and the coefficient of consolidation (Cv) were determined. The log-time plots were relatively flat and could not be used for calculating the coefficient of consolidation (Cv). The square root of time, Taylor's technique, was used to estimate the consolidation coefficient. The range of values for Cv in this study were comparable to other reported values found in the literature.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5407/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Deep Foundations on Brownfields Sites

EPA Grant Number: R825427C003
Subproject: this is subproject number 003 , established and managed by the Center Director under grant R825427 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Urban Waste Management and Research Center (University New Orleans)
Center Director: Kenneth McManis
Title: Deep Foundations on Brownfields Sites
Investigators: G. Boutwell, Mysore Nataraj, Kenneth McManis
Institution: University of New Orleans
EPA Project Officer: Bala S. Krishnan
Project Period: August 17, 1998 through May 30, 2002
Research Category: Urban Waste Management & Research Center

Description:

Brownfields are often desirable building sites because of their location within or close proximity to urban areas. Construction at these sites often raises questions regarding environmental and health issues. One such question is the potential for contaminating deeper aquifers via the pile foundations often required for industrial or multi-story structures. Piles penetrating contaminated soils and driven through an aquitard to achieve end-bearing in a deeper sand aquifer may transfer or provide a migration pathway for contaminants. The current knowledge of pile/soil behavior in a contaminated soil environment is very limited. Consequently, regulatory authorities often require extensive and expensive protection measures (such as grouted casing) for piles in this situation. Thus, there is a real world need to address this topic to serve as a guide in the design of pile foundations in a brownfield environment.

The main concern is that the penetration of the contaminated zone and the aquitard by the pile will transfer and/or allow the migration of contaminants vertically. While there would be slow movement through the clay aquitard, the mechanisms created by the pile are (1) direct transfer of soils at the pile tip, which is a one-time event, (2) flow in the zone disturbed by pile-driving, including the pile/soil interface, and (3) flow through the pile material itself. The flow mechanisms are long-term phenomena. The objective of this study was to evaluate the cited mechanisms to determine if pile foundations can be used in an environmentally safe manner for a brownfield situation without special protective measures. Direct transfer was evaluated through geohydrologic calculations. The vertical transfer of flow along the pile/soil interface and the influence of the pile type was investigated through laboratory modeling. The long-term flow is the most serious potential problem. The model tests investigated the effects of pile type on flow and contaminant migration.

Summary/Accomplishments:

The first evaluation was of direct transfer. A simple theoretical study was carried out to evaluate the direct transfer mechanism. When a pile is driven, its tip can carry down a conical plug of the soil through which it passes. The volume of the soil plug (V) for a flat-tipped pile driven through clay is about 0.15D3, where D is the pile width/diameter. Initially, the contaminant concentration in the pore water of the plug is the same as that in the contaminated upper stratum (co). The volume of actual contaminant in the plug is the plug volume (V) times the soil porosity (n) multiplied by co. Some of the contaminated initial plug is lost during driving, especially when the pile tip passes through stronger materials.

Tests were conducted on the following pile types: No pile or penetration (Control A) round wood pile, untreated penetration with a sand pile (Control B) round metal pile, round wood pile, treated H section metal pile Control B terminated 2.5 cm above the bottom sand. All piles were 2.5 cm in nominal diameter, 50 cm long and had flat tips. The wood piles were tapered slightly in accordance with ASTM D25 standards for wood piles. All piles were driven with a hydraulic press; a guide was used to keep the piles vertical. During the tests, periodic measurements were made for each bottom segment of both the amount of flow and the electrical conductivity simultaneously. Intervals for the measurements were in the order of hours for the first days and later on in days. The "breakthrough" time for the model tests was calculated using Darcy's Law as about 1000 hours. The final tests were therefore permeated about 2400 hours with water, then some 1400 hours with brine.

The data collected from the innermost ring have the greatest effect from the model pile and the least effect from any sidewall interface seepage. The model tests were therefore analysed using only the data from that inner ring.

The results of this study confirmed the findings of the earlier work by Hayman et.al (1),but extended them. Driven piles can be used on even " brownfields" sites without causing adverse environmental effects. However, the proper type(s) of piles must be selected to avoid such effects. The piles should be of a low-permeability material, such as steel and possibly concrete to avoid internal flow. A displacement-type pile such as wood, pipe, or "square" piles should be used to develop the lateral pressure needed to seal any annular space. Use of a pointed pile tip reduces direct transfer of contaminants to a negligible level.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5408/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Ambient Particulate Concentration Model for Traffic Intersections

EPA Grant Number: R825427C004
Subproject: this is subproject number 004 , established and managed by the Center Director under grant R825427 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Urban Waste Management and Research Center (University New Orleans)
Center Director: Kenneth McManis
Title: Ambient Particulate Concentration Model for Traffic Intersections
Investigators: Bhaskar Kura
Institution: University of New Orleans
EPA Project Officer: Bala S. Krishnan
Project Period: January 1, 1998 through December 31, 1999
Research Category: Air Quality

Description:

The objective of this research was to develop a model to predict ambient particulate concentration at traffic intersections based on the traffic volume and meteorological conditions. Field monitoring was performed to collect data on (1) ambient PM10 and PM25 concentrations, (2) traffic volume, (3) traffic composition (types of vehicles), (4) vehicle speed, (5) time of the day. All meteorological observations — wind speed and direction, cloud cover, temperature, relative humidity and rainfall — were obtained from the local weather station. Sun altitude data was obtained from the United States Naval Observatory (USNO). The Rupprecht & Patashnick TEOM Series 1400a Ambient Particulate Monitor, which is approved by the USE PA for continuous PM10 monitoring, was used to monitor PM10 concentrations. Nu-Metrics Hi-Star® Model NC-97 counters were used to obtain traffic data. These counters utilize Vehicle Magnetic Imaging (VMI) to measure vehicle parameters. One counter was installed at or near the center of each lane of t`raffic exiting the intersection using a rubber mat for a protective covering.

The objective of this study was to develop a model that can be used to predict particulate concentrations at traffic intersections based upon traffic and meteorological parameters. The research was undertaken with several expectations. The first was that the particle concentrations would increase as traffic volume increased. Secondly, PM2.5 data were projected to yield much stronger relationships to traffic volumes than PM10. Another belief was that as atmospheric stability increased, overall particle concentrations would also increase.

The results of this study provide a preliminary framework for model development. Data collection was limited due to a number of constraints including time, resources and logistics. Because the results are based on limited data from a single site, it should not be assumed that the results are applicable on a broad scale.

The specific objectives of this project were: to measure ambient particulate concentrations at traffic intersections; to obtain traffic and meteorological data; and to develop a model that predicts ambient particulate concentrations based on traffic and meteorological parameters.

Summary/Accomplishments:

The negative slopes obtained for the category D PM10, versus traffic trend lines were of major concern. PM concentrations attributable to vehicular activity are mostly due to road dust and tire and brake wear. Neither of these items is dependent directly upon traffic volume or vehicle exhaust, but rather on roadway and vehicle conditions. Both streets at the intersection are paved and neither has any unpaved shoulder area. Further investigation is needed to determine the exact cause of the negative trend.

As expected, PM2.5 data were over all more closely related to traffic volumes. This is primarily because PM2.5 can be attributed more directly to vehicle exhaust as the source other than roadway and other external conditions as with PM2.5

It was observed that atmospheric stability increased, so did the concentration of PM2.5. This was attributed to the fact that because PM2.5 are small, they can remain air bound for extended periods of time. When the atmosphere is stable, less dispersion occurs, which allows fine particles to remain entrained in the air at the monitoring site. In case of PM10, more stable conditions yielded lower particle concentrations. With less turbulence, larger particles are able to settle; therefore they are not as likely to be measured as PM2.5.

This research obtained data on traffic density, ambient particulate concentration, and meteorological conditions through field monitoring to develop models to predict ambient particulate concentration at traffic intersections. No acceptable model could be developed for PM10 due to interference. Preliminary models were developed for ambient concentration of PM2.5 for wind speed above 6 m/s and below 6 m/s. Caution should be used in using these models as additional observations are necessary to refine and validate these models.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5386/report/F

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Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Effectiveness of Rehabilitation Approaches for I/I Reduction

EPA Grant Number: R825427C005
Subproject: this is subproject number 005 , established and managed by the Center Director under grant R825427 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Urban Waste Management and Research Center (University New Orleans)
Center Director: Kenneth McManis
Title: Effectiveness of Rehabilitation Approaches for I/I Reduction
Investigators: Marty Tittlebaum
Institution: University of New Orleans
EPA Project Officer: Bala S. Krishnan
Project Period: July 1, 1998 through May 1, 2000
Research Category: Urban Waste Management & Research Center

Description:

After nearly two centuries of urban growth and development, public works officials are confronted with the problems of a deteriorating infrastructure and limited maintenance funding. As many wastewater collection systems reach their design life, increasing infiltration and inflow (I/I) has become a serious problem. Portions of a collection system may be so badly deteriorated that repair alternatives become very limited. There is an urgent need to assemble the necessary experience for various repair options, including trenchless technologies, which will minimize system rehabilitation costs.

Over the last ten years there have been significant improvements in technologies and methodologies for sewer rehabilitation. However, the effectiveness of improved technologies and new techniques have not been evaluated. It is therefore difficult for municipalities to properly design a sewer rehabilitation program that will perform as intended. The purpose of this study is to identify and evaluate the effectiveness of new repair technologies from both an engineering and cost perspective. This evaluation will be based upon repairs associated with sewer mains as well as building laterals. Specific variables to be addressed include design, size, age, and construction materials.

The specific objectives of this study are listed as follows: ·Collection of field data pertaining to different approaches and costs of sewer repair and rehabilitation. Analysis of the field data to evaluate: 1. Effectiveness and costs of the sewer rehabilitation program based on repairing only the sewer mains. 2. Effectiveness and costs of the program based on repairing sewer mains and the lower portions of building laterals. 3. Effectiveness and costs of the program based on repairing sewer mains and the entire building laterals, and 4. Impact of other system variables including design, size, age and construction materials.

There are two general circumstances that require sewer line rehabilitation. The first is when sewer lines are experiencing excessive infiltration. The second is when lines are in need of structural repair. Relining methods (cured-in-place [CIPP], fold and formed [F&F], deformed and reformed [D&R], etc.) are marketed heavily to municipalities mainly to address their infiltration problems.

For the most part, these methods have competed directly with open-cut construction for the rehabilitation of sewer lines. The lower social impacts and the decreasing cost of trenchless technology pipeline rehabilitation make these methods more appealing. Unfortunately, the reduced cost of trenchless technology has been the deciding factor in the selection process for many projects, rather than a thorough engineering evaluation of its relative advantages and disadvantages.

Although open-cut construction has many disadvantages when compared to trenchless rehabilitation, it has one big advantage over trenchless methods: It is easy to find a municipality or consultant who is experienced and knowledgeable about open-cut construction techniques. The same cannot be said for the trenchless rehabilitation method, and one would be hard pressed to find expertise from consultants or municipalities.

Over the past 30 years various sewer rehabilitation techniques for the reduction of I/I have been utilized throughout the United States. The actual evaluation of the effectiveness of these techniques from an I/I reduction and cost benefit aspect has been extremely limited.

Summary/Accomplishments:

The final document was a summary evaluation report which documented the evaluation process, provided recommendations concerning the use of sanitary sewer rehabilitation products, and summarized the findings on the effectiveness and costs of various approaches of sewer rehabilitation. It is intended that this report may serve as a guide by various municipalities to design their I/I and SSO control program.

The survey of existing rehabilitation approaches and techniques has been completed and an extensive history of past performance of engineers/municipalities, along with rehabilitation criteria, has also been documented. The specific rehabilitation approaches and techniques addressed including a detailed descriptions of the findings was included in the final report.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5409/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Urban Solid Waste Management Videos

EPA Grant Number: R825427C006
Subproject: this is subproject number 006 , established and managed by the Center Director under grant R825427 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Urban Waste Management and Research Center (University New Orleans)
Center Director: Kenneth McManis
Title: Urban Solid Waste Management Videos
Investigators: John Sutherlin
Institution: University of New Orleans
EPA Project Officer: Bala S. Krishnan
Project Period: July 1, 1998 through November 1, 1999
Research Category: Urban Waste Management & Research Center

Description:

The project entitled "Urban Solid Waste Management Video Series" consisted of documenting on film the successful solid waste management efforts of the municipalities (i.e., Shreveport, Alexandria, Monroe, Baton Rouge and Lafayette) throughout the state of Louisiana. Although the majority of the background research has taken place at the University of New Orleans' Department of Civil and Environmental Engineering, there was some time dedicated to adapting those efforts to make understandable how public works departments in the municipalities around the state conduct themselves.

The goal of this project was the production of eight (8) 27-minute videos that focus on successful programs, and why these programs work and others do not. For example, Baton Rouge has developed one of the best business recycling programs in all of the Gulf South. Lafayette is considered to have the model for composting. This video series will explain how they were able to achieve this and how other communities can learn from their experiences.

The focus of the series was to present a summary of the issues and options that cities, regardless of budget, politics or geography, must consider when developing a comprehensive solid waste management policy. The series has been widely used by major waste haulers in the US and throughout all major cities in North America to supplement their policy objectives. Additionally, more educators and policy makers from 20 countries around the world have used the series to increase their understanding of American solid waste management.

Episode 1 Waste Generation & Characterization
Episode 2 Waste Collection, Transfer and Disposal (including incineration)
Episode 3 Business Waste Reduction
Episode 4 Residential Recycling
Episode 5 Composting
Episode 6 Special Wastes (i.e., tires, white goods, household hazardous waste)
Episode 7 Regionalization
Episode 8 Conclusions & Summary

The goal here was to document the successes and explain how those efforts can work elsewhere. Thus, prior to the studio production work (both filming and editing), a script for each video was written and all of the footage for the videos was shot. Graphics, charts and all animation was developed as required for each episode. However, all music and format material (such as the building of the stage) was completed before the in-studio production begins. Once the filming of the videos began, all episodes was produced in the order below. Before final production was completed, a time-slot for public television viewing was selected. Then, editing and voice-dubbing was performed as needed. Finally, the video-series were shown "in-house" at a public gathering with state-wide waste experts and then through public television both locally and state-wide. Notices about the series were forwarded to municipalities throughout the Gulf South first, and then to the rest of the US.

The information presented in the videos was based on interviews with directors of waste programs (i.e., Recycling Coordinator of East Baton Rouge Parish), engineers (i.e., BFI and Waste Management) projects and reports. For each video, a script was written and approved before the information contained in that script was filmed. After the filming, the information presented in the videos was again checked for accuracy and completeness. All narration and graphics was provided by professionals in the field and checked for both content and style.

Summary/Accomplishments:

The result of this project was the dissemination of information concerning the best solid waste management, which should impact how all urban communities in the region deal with such issues. The video series was broadcast through local and state public television stations and made available through the Urban Waste Management & Research Center. Additionally, public stations in Waco, Texas and Louisville, Kentucky showed the series. The film series was promoted and distributed through the www.uwmrc.org web site and through press releases through the Environmental News Network. More than 7,500 episodes were distributed to more than 100 US cities and more than 20 countries around the world. The UWMRC also partnered with Films for Humanities & Sciences to distribute the series to educators around the US. Their outlets serve more than 30,000 educators in the US.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5410/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

UWMRC Community Outreach Multimedia Exhibit

EPA Grant Number: R825427C007
Subproject: this is subproject number 007 , established and managed by the Center Director under grant R825427 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Urban Waste Management and Research Center (University New Orleans)
Center Director: Kenneth McManis
Title: UWMRC Community Outreach Multimedia Exhibit
Investigators: Gianna M. Cothren
Institution: University of New Orleans
EPA Project Officer: Bala S. Krishnan
Project Period: October 1, 1998 through June 30, 1999
Research Category: Urban Waste Management & Research Center

Description:

One of the responsibilities of the Urban Waste Management and Research Center is to provoke community involvement in the Center's research activities in municipal solid waste management, water quality, and urban air quality projects. A modernized method of making the research activities available to a wide variety and greater number of participants is to provide visually enhanced, fully automated access to the material generated by the Center. This wealth of knowledge has been made accessible to all interested users via CD ROM or Web access.

The use of electronic technology is a powerfully effective method of reaching the public with scientific information to promote community involvement and education of the Center's mission. The overall objective of this project is to produce a visually enhanced multimedia documentation of past research activities and current research initiatives undertaken by the UWMRC. This exhibit combines text, graphics, audio, and video into one informative, interactive review session of the Center's research efforts.

All existing documentation listed in the annual reports in the form of technical reports, publications in conference proceedings and scientific journals, slide presentations, and poster presentations were to be compiled in a searchable electronic bibliography that is linked to the actual report in cybernetic form. The exhibit is designed using hyper-text markup language (html) and experienced best with a Web browser like Netscape Navigator™ or Microsoft

Explorer™. Users without a browser can open the file without with a word processing package; however, the html coding will appear. The exhibit can be accessed directly from the CD or from the UWMRC web address.

The three areas of research (i.e., municipal solid waste management, water quality, and urban air quality) provide a link to the appropriate material in the bibliography. The program is designed using HTML and popular desktop software and is published with an HTML index page on CD ROM and as a Web site on the internet. The specific tasks involved in the development of this program are: (1) Compiling all previous reports and presentations in standard electronic format, (2) providing the bibliography in five formats, (3) automating hyper-linked slide presentations, (4) provide options for downloading the electronic bibliography or opening on screen to search with a simple to use search engine, (5) develop a multimedia tour of the center's mission, facilities, and current research initiatives as a hyper-link from the home page, (6) produce an instruction/distribution folder and 100 copies of the CD for distribution.

Summary/Accomplishments:

This multimedia exhibit is a compilation of the Urban Waste Management and Research Center's recent and past technical reports and publications, presentations, and community outreach initiatives into one informative electronic bibliography and multimedia tour. It is an outreach opportunity_that provides the public with a complete knowledge of the Center's mission and accomplishments. The electronic database is an excellent tool for researchers in the scientific community who are interested in municipal solid waste management, water quality, and urban air quality. These CD's will be distributed at conferences and public meetings for participants to take back to the office, access the information, and share it with other colleagues.

All of the documents available in the storage facility for UWMRC publications were surveyed and many of the documents were scanned in. Only the abstract or executive summary of the larger documents were scanned. One major problem encountered during this project was that hard copies of only a few of the references from the annual reports were available in the Center's library. Only a few of the electronic copies of the UWMRC reports and papers were available. Therefore, all of the references in the database do not have a link to the complete document.

The final deliverable is in the form of a CD. The CD is included along with this report. Additionally, the database can be accessed on the website at http://www.uwmrc.org .

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5402/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Including New Technology into the Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems - A User's Guide

EPA Grant Number: R825427C008
Subproject: this is subproject number 008 , established and managed by the Center Director under grant R825427 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Urban Waste Management and Research Center (University New Orleans)
Center Director: Kenneth McManis
Title: Including New Technology into the Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems - A User's Guide
Investigators: Donald Barbe, Robert E. Pitt, Melinda Marsh Lalor
Institution: University of New Orleans
EPA Project Officer: Bala S. Krishnan
Project Period: July 1, 1998 through December 31, 1999
Research Category: Urban Waste Management & Research Center

Description:

This project investigated previously developed methods used to identify sources of contaminants in storm drainage systems, plus a review of emerging techniques that may also be useful. The original methods, along with selected new procedures, were tested. The original methods are still recommended as the most useful procedure for identifying contamination of storm drainage systems, with the possible addition of specific tests for E. coli and enterococci and UV absorbance at 228 nm. Most newly emerging methods require exotic equipment and unusual expertise and are therefore not very available, especially at low cost and with fast turn-around times for the analyses. These emerging methods may therefore be more useful for special research projects than for routine screening of storm drainage systems.

Urban stormwater runoff includes waters from many other sources which find their way into storm drainage systems, besides from precipitation. There are cases where pollutant levels in storm drainage are much higher than they would otherwise be because of excessive amounts of contaminants that are introduced into the storm drainage system by various non-stormwater discharges. Additionally, baseflows (during dry weather) are also common in storm drainage systems. Dry-weather flows and wet-weather flows have been monitored during numerous urban runoff studies. These studies have found that discharges observed at outfalls during dry weather were significantly different from wet-weather discharges and may account for the majority of the annual discharges for some pollutants of concern from the storm drainage system.

Summary/Accomplishments:

Detergent measurements (using methylene blue active substance, MBAS, test methods) were the most successful individual tracer to indicate contaminated water in storm sewerage dry-weather flows. Unfortunately, the MBAS method uses hazardous chloroform for an extraction step. Different detergent components, especially linear alkylbenzene sulphonates (LAS) and linear alkylbenzenes (LAB), have also been tried to indicate sewage dispersal patterns in receiving waters. Boron, a major historical ingredient of laundry chemicals, can also potentially be used. Boron has the great advantage of being relatively easy to analyze using portable field test kits, while LAS requires chromatographic equipment. LAS can be measured using HPLC with fluorescent detection, after solid phase extraction, to very low levels. Fujita, et al. (1998) developed an efficient enzyme-linked immunosorbent assay (ELISA) for detecting LAS at levels from 20 to 500 μg/L.

Laboratory tests were conducted using many sewage and laundry detergent samples and found that the boron test was a poor indicator of sewage, possibly due to changes in formulations in modern laundry detergents. Other laboratory tests found that fluorescence was an excellent indicator of sewage, especially when using specialized "detergent whitener" filter sets, but was not very repeatable. We also examined several UV absorbance wavelengths as sewage indicators and found excellent correlations with 228 nm, a wavelength having very little background absorbance in local spring waters, but with a strong response factor with increasing strengths of sewage. We recommend that our originally developed and tested protocol still be used as the most efficient routine indicator of sewage contamination of stormwater drainage systems, with the possible addition of specific E. coli and enterococci measurements and UV absorbance at 228 nm. The numerous exotic tests requiring specialized instrumentation and expertise reviewed in this paper do not appear to warrant their expense and long analytical turn-around times, except in specialized research situations.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/541 l/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Investigation of Hydraulic Characteristics and Alternative Model Development of Subsurface Flow Constructed Wetlands

EPA Grant Number: R825427C009
Subproject: this is subproject number 009 , established and managed by the Center Director under grant R825427 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Urban Waste Management and Research Center (University New Orleans)
Center Director: Kenneth McManis
Title: Investigation of Hydraulic Characteristics and Alternative Model Development of Subsurface Flow Constructed Wetlands
Investigators: Gianna M. Cothren
Institution: University of New Orleans
EPA Project Officer: Bala S. Krishnan
Project Period: August 1, 1998 through May 1, 2001
Research Category: Urban Waste Management & Research Center

Description:

A trend of increasing dispersion with decreasing aspect ratio as a function of width and of increasing dispersion with increasing flow rate were found in previous work using a bench-scale model (Cothren, 1996). The objectives of this research are to validate these results relating dispersion and system characteristics and to perform a complete water balance and hydraulic characteristic evaluation on a selected full-scale system. The results can then be used to model the SFCW system with an alternative to the common simple plug flow approach. Specifically, the objectives of this research are to: 1. Develop a coefficient relating pan evaporation to the actual evaporation from a SFCW as part of the water balance and hydraulic characteristics evaluation. 2. Evaluate the hydraulic characteristics of a selected SFCW by performing a water balance including inflow, outflow, precipitation, evapotranspiration and seepage. 3. Perform experimental tracer studies an operational SFCW system in Louisiana in order to determine hydraulic residence time and dispersion number. 4. Verify the trend of increasing dispersion with decreasing aspect ratio found in previous research. 5. Investigate an alternative model for the SFCW system that does not neglect the effect of dispersion.

Conclusions: Equations were developed relating evaporation from SFCW media to pan evaporation. These equations were site specific and seasonally dependent. It can be inferred that the geographical location of the wetland cell would also affect the relationship due to climate ·

conditions such as wind, solar radiation, ambient temperature and humidity. The equation developed for the specific media type and for the same season did a reasonably good job of predicting the evaporation from an unplanted cell, estimating the loss calculated from a water balance to within 5% where the estimate using Ep directly was 32 % less than the actual. This method could prove to be a useful tool once enough data is gathered to develop tables of coefficients for design use. Media type, plant type, geographical location and physical characteristics of the specific reactor such as shading and wind blockage must be considered. Seasonal effects are also significant. Even when the reactor is not planted, solar radiation in conjunction with the reflective/ absorptive characteristics and heat retention capability of the media cause seasonal differences.

A water balance was performed assuming that there was no loss due to seepage. The imprecision of the meter used to control inflow, especially at the low flow rate used, may have introduced some error. Since the inflow and outflow were summed over a long period, any variations in flow should have averaged out and thus provided a fairly good estimate of the total. A method to obtain a more accurate estimate of ET is essential since losses from ET can lower the water level and increase the HRT in a SFCW system, especially in southern climates.

Residence time distribution curves were developed from tracer experiments and were used to determine mean residence times and longitudinal dispersion numbers for variety of scenarios. The trend of increasing dispersion with decreasing aspect ratio found in previous research could not be verified by these results. For the aspect ratios investigated here, no significant relationship was found. This does not necessarily refute the previous findings. In the prior work, it was found that the aspect ratio relationship does not become controlling until aspect ratio is lower than 2:1. This research included only one aspect ratio in this category, so a determination of trend in this interval was impossible. Also, in the research conducted at bench scale, the aspect ratio was varied by changing the width. This was not feasible in this study because a variable length was used. Neither investigation held the volume of the cell constant.

A trend of increasing longitudinal dispersion with increasing interstitial velocity was confirmed by correlation analysis, yielding a Pearson's correlation coefficient of 0.93. This trend became more pronounced at higher velocities. There appears to be a critical velocity where this relationship intensifies. This finding agrees with the conclusion of the previous bench scale research. Since the intensification of the relationship between dispersion and velocity appears to occur at nearly the same velocity that the Reynolds number surpasses the accepted Reynolds number where turbulent flow develops, the critical velocity mentioned above is likely to coincide with the transition from laminar to turbulent flow.

The CSTR-in-Series model gave a reasonably good fit for the residence time distributions as the tracer passed the ports at the near end of the cell. As the distance down the cell increased, the model underestimated the peak concentrations.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5412/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Beneficial Use Of Urban Runoff For Wetland Enhancement

EPA Grant Number: R825427C010
Subproject: this is subproject number 010 , established and managed by the Center Director under grant R825427 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Urban Waste Management and Research Center (University New Orleans)
Center Director: Kenneth McManis
Title: Beneficial Use Of Urban Runoff For Wetland Enhancement
Investigators: Gianna M. Cothren, A. P. Hannoura, J. A. Nyman
Institution: University of New Orleans
EPA Project Officer: Bala S. Krishnan
Project Period: July 1, 1998 through July 1, 2000
Research Category: Urban Waste Management & Research Center

Description:

The concept of using natural wetlands to reduce nutrient loading to receiving waters is consistent with national efforts to reduce eutrophication in estuaries. The concept of restoring freshwater inflows to estuarine wetlands, artificially isolated from historic freshwater inflows, is also consistent with national efforts to restore critical estuarine wildlife and fisheries habitat. Simultaneously mitigating nutrient loading to estuarine waters and losses of historic freshwater inflows to estuarine wetlands is central to the Center's mission that includes research in seeking alternative methods for managing wastes.

The Coastal Wetland Planning, Protection and Restoration Act (CWPPRA), approved by the U.S. Congress in 1990 provides support for constructing and monitoring projects aimed at restoring coastal marshes nationwide. In Louisiana, a project utilizing urban runoff to restore freshwater inflow to an estuarine marsh was approved (LDNR, 1995). CWPPRA uses aerial photography, habitat mapping, spatial analysis, vegetation sampling, and water chemistry sampling to determine the effects of increasing urban runoff on environmental quality in the marsh. Simultaneous determination of the effectiveness of the marsh at treating the urban storm water runoff is needed to guide urban wastewater managers, but is beyond the scope of CWPPRA's monitoring activities. Design and maintenance of wetland systems for treating urban runoff depends upon sediment and nutrient fluxes through the system. Nutrient source/sink rates in a wetland system will lead to potential loading rates obtainable for treatment of urban runoff and wetland restoration. Types of data needed to better understand the role of wetlands in nutrient dynamics in general include nutrient input sources and rates, and nutrient sinks and rates, but are unavailable.

The objectives of this research are to establish a mass balance for the discharging of urban runoff, establish nutrient fluxes in a naturally occurring estuarine wetland, and to establish nutrient and sediment storage rates in a naturally occurring estuarine wetland receiving urban runoff. Water discharge, nutrient flux, and long-term storage rates of nutrients and sediments for the Fritchie Marsh are to be determined. Collectively, these data will be used to demonstrate that the marsh is improving water quality, to quantify nutrient and sediment loading rates, and to quantify the long-term nutrient and sediment storage rates.

Data collection prior to construction of the CWWPRA project has been completed. The original LDNR construction date was scheduled for November 1998. Construction was placed on hold because a landowner had qualms about having his property included in the agreement. Construction was repeatedly delayed and was last expected to begin by the end of September 1999, but did not. Therefore the post project monitoring phase to complete the technical objectives of this project was never performed. Considering the construction delay problems that hindered post construction monitoring; it is premature to outline any conclusions regarding the effectiveness of the urban runoff enhancement of the Fritchie Marsh Area.

Summary/Accomplishments:

Accretion in Fritchie Marsh averaged 0.63 cm/yr with the northern site accretion averaging 0.53 cm/yr and the accretion at the southern site averaging 0.84 cm/yr. This difference between northern and southern sites suggests that a shallow, active fault runs through Fritchie Marsh. Such faults are common in coastal Louisiana in general and around Lake Pontchartrain. The bulk density estimates were combined with the vertical accretion estimates to determine the rate at which material is being stored in marsh soil at the two sites. Storage averaged 1.3 kg m^{-2} yr^{-1} at the northern site and 1.6 kg m^{-2} yr^{-1} at the southern site which is probably related to the more rapid subsidence at the southern site induced by the fault. The Fritchie marsh stores an annual average of 5,872 kg/acre. Extrapolated over the entire Fritchie Marsh area, it appears that this site stores slightly over 6 million kg of material annually.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5413/report/F

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Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Urban Storm and Waste Water Outfall Modeling

EPA Grant Number: R825427C011
Subproject: this is subproject number 011 , established and managed by the Center Director under grant R825427 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Urban Waste Management and Research Center (University New Orleans)
Center Director: Kenneth McManis
Title: Urban Storm and Waste Water Outfall Modeling
Investigators: J. A. McCorquodale
Institution: University of New Orleans
EPA Project Officer: Bala S. Krishnan
Project Period: January 15, 1998 through January 15, 2001
Research Category: Urban Waste Management & Research Center

Description:

In 1985, an advisory discouraging swimming and other primary contact recreational activities in Lake Pontchartrain was issued by the Louisiana Department of Health and Hospitals (LDHH). This advisory names fecal coliform (FC) bacteria as the causative pollutant and is still in effect today for the south shore area of the lake as mandated by the LDHH in conjunction with the Louisiana Department of Environmental Quality (LDEQ).

A water quality shoreline study in the area affected by the advisory was initiated in September of 1998 and continued until 2001. Five sites that are or were at one time used for primary and secondary contact recreation were selected for study. Two of the sites represent outlets of urban runoff drainage canals while the others are beach or recreational park areas found near the canals. The parameters measured at these sites are FC, salinity, conductivity, water temperature, nitrogen as ammonia, total nitrogen as nitrite/nitrate, total phosphorus, phosphorus as ortho-phosphate, total suspended solids, volatile suspended solids and pH. This project confirmed that fecal contamination at four out of five sites along the south shore of Lake Pontchartrain is caused by urban runoff discharged to the lake via a drainage system of collection sewers, pumping stations and canals. The flows and ambient conditions of this system result in slowly spreading outfall plumes characterized by shore reattachment and low dilution. The fifth site had a signature that indicated an active source other than storm water runoff.

Modeling of the outfall plumes is needed for delineating shoreline contamination and investigating possible remediation. Integral type numerical models for neutral-density and surface-buoyant discharges have been developed for discharge from wide aspect ratio drainage channels. The models presented were calibrated using laboratory results and verified with field data from the south shore site on Lake Pontchartrain. The outfall model was coded in FORTRAN with a Visual Basic interface. Neutral density and buoyant density models were developed. These models solve the continuity, conservation of momentum, mass conservation and buoyancy conservation equations subject to a user defined canal effluent and ambient lake conditions. The models used the longshore currents from the RMA2 model of Haralampides (2000) as well as drifter data from Lake Pontchartrain Basin Foundation (LBPF).

The primary objective of this project was to develop an outfall model that would complement the CORMIX 2 model by including outfalls with aspect ratios greater than 4. A secondary objective was to document the role of storm and ambient water mixing in the drainage canal in the overall dilution process.

Summary/Accomplishments:

Evidence was found that urban stormwater discharges to this south shore area of the lake are a source of nutrients and solids as well as pathogens (as indicated by FC bacteria). Cross-contamination of the stormwater runoff effluents by sanitary sewer flows is a suspected source of pathogens, nutrients and solids. The FC bacteria, ammonia and total nitrogen as nitrite/nitrate data collected in the shoreline monitoring program confirmed that the near field dilution (up to 30 channel widths) of the drainage canal plumes is very low, of the order of 2:1 to 5:1.

This project clearly established a statistical relationship between the occurrence of rainfalls in excess of 0.5 inches and fecal coliform (FC) contamination of the shoreline near the urban stormwater outfalls at four out of five sites that were studied.

A product of this project is a predictive model to aid design engineers and environmental managers in assessing the near and intermediate field impacts of existing and proposed outfalls with aspect ratio > 3 which is not available in CORMIX. The integral version of the outfall model has a VB6 user interface. This software and a User's Guide for the integral models have been included with this report.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5414/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Integrated Petroleum Environmental Consortium (IPEC)

EPA Grant Number: R827015
Center: IPEC - University of Tulsa (TU)
Center Director: Kerry Sublette
Title: Integrated Petroleum Environmental Consortium (IPEC)
Investigators: Kerry Sublette
Institution: University of Tulsa
EPA Project Officer: Bala S. Krishnan
Project Period: October 1, 1998 through September 30, 2003
Research Category: Integrated Petroleum Environmental Consortium (IPEC)

Description:

The Integrated Petroleum Environmental Consortium (IPEC) is a consortium of four universities in Oklahoma and Arkansas: The University of Tulsa (TU), The University of Oklahoma (OU), Oklahoma State University (OSU), and The University of Arkansas (UA) at Fayetteville. The fiscal center of IPEC is the University of Tulsa. The consortium has the following specific objectives:

Development of new, cost-effective technologies for the solution of environmental problems in the petroleum industry to improve the competitiveness of the industry

Dissemination of information regarding state-of-the-art petroleum environmental technology, new technology development, and legal and regulatory issues which can impact the competitiveness of the domestic petroleum industry.

The strategic and economic importance of this industry requires that industry, government and academia combine their resources and coordinate their efforts toward finding solutions for the environmental problems that represent the greatest challenge to the competitiveness of the domestic petroleum industry. The success of this effort will not only stimulate jobs in this industry sector, but also contribute in a large way to the environmental health of the nation. In response to this need, the four major research universities in the oil-producing states of Oklahoma and Arkansas have joined together to form the Integrated Petroleum Environmental Consortium (IPEC). The mission of IPEC is to increase the competitiveness of the domestic petroleum industry through a reduction in the costs of compliance with U.S. environmental regulations. Objectives specific to meeting the goals of the consortium include the following:

1.Development of cost-effective technologies to meet the challenges of environmental regulations to the competitiveness of the domestic petroleum industry.

2.Dissemination of information regarding state-of-the-art petroleum environmental technology, new technology development, and legal and regulatory issues which can impact the competitiveness of the domestic petroleum industry

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Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Project Period Concluded
Reports: 1999

Evaluation of Road Base Material Derived from Tank Bottom Sludges

EPA Grant Number: R827015C001
Subproject: this is subproject number 001 , established and managed by the Center Director under grant R827015 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: IPEC - University of Tulsa (TU)
Center Director: Kerry Sublette
Title: Evaluation of Road Base Material Derived from Tank Bottom Sludges
Investigators: John N. Veenstra, Dee Ann Sanders, Donald R. Snethen
Institution: University of Oklahoma
EPA Project Officer: Bala S. Krishnan
Project Period:
Project Amount: Refer to main center abstract for funding details.
Research Category: Integrated Petroleum Environmental Consortium (IPEC)

Description:

The purpose of the proposed research is to investigate the potential of using tank bottom sludge in combination with different aggregate to form an acceptable road base material. There are four specific goals. (1) Evaluate the properties of various aggregate/tank bottom sludge mixtures for suitability as road base material. (2) Compare the properties of the aggregate/tank bottom sludge mixtures to certain grades of asphalt emulsions. (3) Assess the potential for leaching of metals and hydrocarbons from the aggregate/tank bottom sludge road base material. (4) Provide recommendations on design/construction for road base material using tank bottom sludges.

The study will focus on determining the general quality of road base material for secondary and/or low traffic volume roads that can be made using crude oil tank bottom sludges. Initial studies will be concerned with characterizing the properties of the tank bottoms for commonly used asphalt emulsions characterizations. Additionally, the tank bottoms will be subjected to environmental analysis to characterize the potential for release of hazardous compounds from the finished asphalt road base.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1841/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Project Period Concluded
Reports: 1999

Passive Sampling Devices (PSDs) for Bioavailability Screening of Soils Containing Petrochemicals

EPA Grant Number: R827015C002
Subproject: this is subproject number 002 , established and managed by the Center Director under grant R827015 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: IPEC - University of Tulsa (TU)
Center Director: Kerry Sublette
Title: Passive Sampling Devices (PSDs) for Bioavailability Screening of Soils Containing Petrochemicals
Investigators: Roman Lanno, Kathleen Duncan
Institution: University of Oklahoma
EPA Project Officer: Bala S. Krishnan
Project Period:
Project Amount: Refer to main center abstract for funding details.
Research Category: Integrated Petroleum Environmental Consortium (IPEC)

Description:

Although total petrochemical levels in different soils may be similar on a chemical basis, biological responses may vary over 100-fold due to differing physical and chemical characteristics of the soil that affect chemical bioavailability. For example, organic matter content differs among soils and will sorb nonpolar compounds, reducing their bioavailabilty to soil organisms. This project examines the issue of bioavailability of hydrocarbons in soils. Due to the partitioning behavior of hydrocarbons in soil, total hydrocarbon measures (e.g., TPH) overestimate the amount of hydrocarbon that is actually available for degradation by microbes during bioremediation or for toxic action on soil-dwelling organisms. The bioavailability of chemicals in soils can be estimated indirectly by measuring toxicity to soil invertebrates or microbial activity, or directly by measuring the amount of chemical present in soil organisms.

The objective of this study is to correlate various chemical measures of hydrocarbon availability in soil (e.g., TPH, semi-permeable membrane device uptake, solid-phase microextraction measures) with biological measures of bioavailability (e.g., microbial activity, types of microbes present, earthworm toxicity and bioaccumulation). These measurements will be conducted in the field at sites at the Tallgrass Prairie Preserve, Pawhuska, OK. Sites here have been subject to oil spills in Feb. 1999 and 1991, providing a dramatic gradient in total hydrocarbon.

The ultimate goal of this research is to develop sensitive chemical measures of hydrocarbon bioavailability that are well correlated with and can reduce reliance on the more expensive and time-consuming biological measures of bioavailability.

Progress and Final Reports:

1999 Progress Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1843/report/1999

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Demonstration of a Subsurface Drainage System for the Remediation of Brine-Impacted Soil

EPA Grant Number: R827015C003
Subproject: this is subproject number 003 , established and managed by the Center Director under grant R827015 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: IPEC - University of Tulsa (TU)
Center Director: Kerry Sublette
Title: Demonstration of a Subsurface Drainage System for the Remediation of Brine-Impacted Soil
Investigators: Thomas M. Harris, John N. Veenstra
Institution: University of Tulsa
EPA Project Officer: Bala S. Krishnan
Project Period:
Project Amount: Refer to main center abstract for funding details.
Research Category: Integrated Petroleum Environmental Consortium (IPEC)

Description:

Oilfield brine-impacted soil is the most common environmental problem associated with oil production in Oklahoma. Salt causes the outright death of plants, and the consequent erosion of topsoil. Also, brine-impacted soil serves to contaminate surface waters and shallow aquifers. In addition to these issues, the remediation of brine-impacted soil may be motivated by lease agreements, federal and state regulations, landowner claims, and the fear of long-term liability.

At the present time, the most common remediation strategy applied to brine-impacted soil is in-situ chemical amendment (ISCA), in which gypsum, manure and/or other materials are added to the soil to restore its permeability and fertility. Of course, this strategy is inappropriate when groundwater must be protected from contamination. At the same time, the ISCA approach will fail if the salt is unable to migrate downward through the soil profile. Such conditions exist, for example, in the Tallgrass Prairie Preserve in Oklahoma; the subsoil is naturally impermeable in this region. A field demonstration of a subsurface drainage system that has been operating in the Preserve since December, 1997, features disposal of the salty leachate in an existing injection well.

The project proposed below, which concerns the further development of subsurface drainage systems for brine-impacted soil remediation, has two objectives. The first is to evaluate innovative uses of limestone gravel in the drainage, for the purpose of reducing installation costs, and extending this technology to "historical" spill sites (i.e. where much of the topsoil has been eroded). The second objective is to demonstrate the use of a solar evaporation pond for crystallizing the salt from the leachate, so that it may be disposed of at minimal cost. Such ponds should allow subsurface drainage to be applied at sites where an injection well is not available.

Gravel is commonly employed in subsurface drainage systems to limit the accumulation of sediment in the drainage pipes. If limestone gravel is employed, it may also serve to enhance the permeability of the surrounding soil, by providing the calcium ions required to counteract the sodicity of the brine-impacted soil. Combining sulfur with the limestone should allow the calcium carbonate to be converted (through the action of soil microbes) to the more soluble calcium sulfate. In addition to the treatment of contemporary spills, these strategies will be considered for the treatment historical spills, where "clean" topsoil applied to the site must be protected from the upward migration of salt during periods of dryness.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Anaerobic Intrinsic Bioremediation of Whole Gasoline

EPA Grant Number: R827015C004
Subproject: this is subproject number 004 , established and managed by the Center Director under grant R827015 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: IPEC - University of Tulsa (TU)
Center Director: Kerry Sublette
Title: Anaerobic Intrinsic Bioremediation of Whole Gasoline
Investigators: Joseph Suflita
Institution: University of Oklahoma
EPA Project Officer: Bala S. Krishnan
Project Period:
Project Amount: Refer to main center abstract for funding details.
Research Category: Integrated Petroleum Environmental Consortium (IPEC)

Description:

The business practice of relying on intrinsic bioremediation for the removal of spilt gasoline hydrocarbons (HCs) in the environment is a major regulatory issue influencing Risk Based Corrective Action (RBCA) assessments. Intrinsic bioremediation offers promise for the restoration of gasoline-tainted environments with minimal intervention and, therefore, cost to achieve regulatory compliance. However, assessments of intrinsic gasoline bioremediation have generally only focused on the so called BTEX-HC (Benzene, Toluene, Ethylbenzene and Xylene isomers). While the anaerobic bioconversion of BTEX is becoming more widely accepted, regulatory attention is shifting toward the fate of these HC in the presence of other gasoline components. Additionally, the prospects for the microbial metabolism of the non-BTEX HC is also attracting increased regulatory scrutiny. A full appreciation of the prospects for the intrinsic bioremediation of BTEX and other gasoline components is lacking. Further, there is no consensus on the most reliable method of assessing the intrinsic anaerobic bioremediation of HC. Lastly, field evidence for the intrinsic bioremediation of HC,if often indirect and generally relies on inferences based on measured geochemical parameters. A more direct indication of HC decay may possibly be obtained through the use of biomarkers. However, information on the use of biomarkers to assess anaerobic HC decay is simply lacking.

This project will address each of the aforementioned issues by investigating the anaerobic bioconversion of whole gasoline using sediment samples (as inocula) obtained from an IPEC research site in Ft. Lupton, CO known to exhibit the anaerobic intrinsic bioremediation of HCs. This site is easily the most active location we have worked with to date with respect to intrinsic anaerobic HC decay. Moreover, the site is accessible and the focus of ongoing sponsored (DOE) collaborative investigations among investigators from IPEC institutions into the prospects for intrinsic HC remediation. To compare the importance of adaptation experiments will be repeated with material sampled from the Norman landfill site. The latter site is a benchmark for many studies in the literature and represents a well characterized location that is not chronically exposed to HC.

As noted, this project is designed to investigate the anaerobic biodegradation of whole gasoline, rather than Individual components or classes of HCs. Specifically it will address 1) the anaerobic removal of BTEX hydrocarbons in the presence of other HC co-contaminants, 2) the influence of alternate electron acceptors on the processes identified under item 1 above, 3) the prospects for the biodegradation of non-BTEX HCs, 4) the development of biomarkers as indicators of anaerobic HC decay, and 4) the influence of microbial adaptation processes on the items l-3. To these ends, the project will monitor the consumption of electron acceptors and/or the production of metabolic endproducts (i.e. methane or hydrogen sulfide) as appropriate. Specifically, gasoline biodegradation will be examined under denitrifying, iron-reducing, sulfate-reducing, and methanogenic conditions. This information will be coupled with information on the removal of potential electron donors through the simultaneous monitoring of at least 55 HCs using GCYMS analysis. The experiments will be interpreted relative to sterile, HC-unamended, and positive controls. The experiments will help define the limits associated with anaerobic gasoline bioremediation, provide an assessment of gasoline decay under realistic conditions, and allow for the development of new biomarker indications of the anaerobic intrinsic remediation of gasoline.

The proposed research is highly relevant from a societal standpoint. A more complete understanding of the mechanisms of intrinsic bioremediation could make this business practice a common and even preferred remedial option when performing Risk Based Corrective Action analysis or proposing a corrective action plan for any HC-tainted site. There are literally tens of thousands of production wells, tank batteries, and surface and underground storage tanks where leaks have and are occurring in the US. At any site where groundwater is contaminated or threatened by these leaks, predictions based on our results could be used to prioritize the locations needing immediate remedial action. By focusing precious resources on locations where the threat is more acute, a savings will be realized both in terms of financial resources and in terms of rational environmental policy.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Microflora Involved in Phytoremediation of Polyaromatic Hydrocarbons

EPA Grant Number: R827015C005
Subproject: this is subproject number 005 , established and managed by the Center Director under grant R827015 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: IPEC - University of Tulsa (TU)
Center Director: Kerry Sublette
Title: Microflora Involved in Phytoremediation of Polyaromatic Hydrocarbons
Investigators: David P. Nagle, John S. Fletcher
Institution: University of Oklahoma
EPA Project Officer: Bala S. Krishnan
Project Period:
Project Amount: Refer to main center abstract for funding details.
Research Category: Integrated Petroleum Environmental Consortium (IPEC)

Description:

Polyaromatic hydrocarbons (PAHs) comprise a major class of recalcitrant industrial pollutants and are a significant byproduct of coal, chemical, and petroleum processing and refining. PAHs are concentrated in food chains, are toxic, and some (e.g. benzo[a]pyrene) are recognized mutagens and carcinogens. The EPA guidelines for containment and control of PAH compounds have become more and more strict. Older disposal methods, such as lagooning, are no longer acceptable in the long term. Phytoremediation has the potential to be applied m a "living cap" of plants and associated microorganisms which will alleviate pollution in the medium term (tens of years). The costs of such waste treatment are far below those required for installation of an impermeable cap or incineration of contaminated soil. In this project data from a Texas City Union Carbide Corp. PAH site will be used in evaluating the potential for use of phytoremediation of PAHs. It should be possible to predict what plants will be favorable for stimulating microbial biodegradation of PAHs, and to design test protocols for additional contaminated sites. The proposed research also encompasses many basic questions, such as what influences the interactions between roots and microorganisms. The answers to such questions may be exploited in the long term in other bioremediation schemes.

Union Carbide Corporation is committed to environmentally-friendly remediation of its plants. The Texas City PAH site is a remnant of old containment practices. When it became apparent that the vegetation contributed to improvement of the site (conversion of waste to soil and decrease in PAH levels in the soil), Union Carbide began to support basic research into the processes that had occurred. They provided historical data, aerial photographs, and other information, such that the history of the site could be reconstructed over the 20-year period in which the vegetation developed, and provided unlimited access to the site for research purposes. Carbide has been very pro-active in implementing bioremediation schemes for PAH contamination. In the spring of 1997 they planted two 17-acre PAH-impacted sites at the Texas City plant as a test of different plant species as potential phytoremediators. These sites will also be very useful in studies of the microflora that develops in a newly begun phytoremediation systems. In fact, they may be a model of the original PAH-contaminated site during its early years of vegetation and microflora development.

The proposed research is a two-year study of microorganisms from an industrial research area which is contaminated with polyaromatic hydrocarbons (PAHs). The site has been populated with native plants through a process of natural succession over a period of 15 to 20 years. Chemical characterization of samples shows that PAH concentrations increase with depth, and in areas of the site which now contain mature trees the regions of lower concentration are deeper than in nearby grassy areas. The results lead to a hypothesis that trees and microflora have acted in concert to bioremediate soil contaminants in the root region, suggesting that it is critical to study what has happened and what is happening in to the pollutants in the field. This contrasts to the approach of a pure laboratory study followed by attempts to introduce new technology to the field. If it is true that the plant-microbe system has accelerated the biodegradation of PAHs, then analysis of a field site should be the most rapid route to planned implementation of phytoremediation.

Studies on the microflora from the PAH-impacted site and their relationship to plants growing there will utilize both classical microbiology and molecular biology methods. Plant and chemical analysis work is now being complemented by an extensive quantitative and qualitative characterization of bacteria in different vegetated regions and at different depths of the field site. To date, counts of total bacteria, as well as of bacteria apparently capable of using PAHs (naphthalene, phenanthrene, or pyrene) as carbon/energy source have been performed. Analysis of the data is not yet complete, but it is already clear that the number of bacteria decreases dramatically at the interface between soil and PAH-containing sludge. In bulk samples of soil beneath grassy or tree-containing regions there is no significant difference in bacterial numbers between samples taken at corresponding depths. What has not been tested is the local region around the roots themselves.

Two hundred bacterial strains were isolated, with PAH as sole carbon and energy source. Partial characterization (staining, physiological tests) indicates that these PAH-degraders are diverse: both Gram-negative and Gram-positive bacteria, representing many genera were found. A subset of these strains was tested for the presence of plasmids (extrachromosomal genetic elements). Certain plasmids provide metabolic abilities on their hosts, and some are known to permit metabolism of PAHs. of our strains, some but not all contain plasmids, whose functions are not yet known. It is possible to conclude, however, that PAH utilization is not exclusively plasmid-coded.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Microbial Treatment of Naturally Occurring Radioactive Material (NORM)

EPA Grant Number: R827015C006
Subproject: this is subproject number 006 , established and managed by the Center Director under grant R827015 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: IPEC - University of Tulsa (TU)
Center Director: Kerry Sublette
Title: Microbial Treatment of Naturally Occurring Radioactive Material (NORM)
Investigators: Lee R. Krumholz, Mark Hasegawa
Institution: University of Oklahoma
EPA Project Officer: Bala S. Krishnan
Project Period:
Project Amount: Refer to main center abstract for funding details.
Research Category: Integrated Petroleum Environmental Consortium (IPEC)

Description:

Radioactive material has been known to be associated with both oil and gas deposits for many years. The presence of NORM at oil production facilities has recently increased in significance as federal and state regulatory agencies lay out more stringent guidelines for dealing with it. It will therefore influence Risk based decision making and the overall economics of oil production. In this proposal, we outline a plan to develop a technique for the dissolution of radioactive scale associated with oil production equipment. More specifically, we intend to design an anaerobic microbiological treatment process that will specifically dissolve radium sulfate which has precipitated on equipment in contact with oil production waters. By consuming sulfate and converting it to sulfide, sulfate reducing microorganisms will draw the relatively insoluble radium sulfate into solution as Ra2+. The radium then in solution could be transferred to another vessel where it will be re-precipitated and concentrated as the sulfate or carbonate salt for eventual disposal. The result will be the removal of radioactive material from large pieces of functional equipment with its transfer to a smaller more easily disposed of and less costly vessel. Because barium is very similar to radium in its specific ligand interactions, barium can be used as a surrogate for radium. However, all studies will be verified with radium salts and naturally occurring radium scale from oil production equipment.

We will initially focus on (1) optimizing the microbiological conditions needed for the dissolution of radium scale; (2) development of a microbiological system scaled for the treatment of contaminated tools, casings and vessels; (3) optimization of a chemical treatment system using carbonate or sulfate salts for re-precipitating and concentrating radium out of solution for subsequent disposal. These experiments over the short period will generate the initial results needed to determine the viability and cost as well as design a pilot scale system for the use of microbial treatment in dealing with radium containing scale on metal and plastic surfaces.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Using Plants to Remediate Petroleum-Contaminated Soil

EPA Grant Number: R827015C007
Subproject: this is subproject number 007 , established and managed by the Center Director under grant R827015 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: IPEC - University of Tulsa (TU)
Center Director: Kerry Sublette
Title: Using Plants to Remediate Petroleum-Contaminated Soil
Investigators: Greg Thoma, Duane Wolf, Craig Beyrouty
Institution: University of Arkansas at Fayetteville
EPA Project Officer: Bala S. Krishnan
Project Period:
Project Amount: Refer to main center abstract for funding details.
Research Category: Integrated Petroleum Environmental Consortium (IPEC)

Description:

Numerous techniques exist for remediating hydrocarbon contaminated soils. Most of these are expensive and labor intensive, often requiring significant disturbance of the soil to achieve clean up. Thousands of oil drilling rigs remain in operation to delay remediation because current technology is cost prohibitive. Phytoremediation is a process that uses actively growing plant roots to stimulate a diverse population of soil microorganisms, some of which have the capability to metabolize hydrocarbon contaminants. This process is relatively non-invasive, does not require extensive capital investment, and can enhance soil properties. Using plants and the associated rhizosphere (soil adjacent to roots) microorganisms to enhance biodegradation of petroleum contaminants may provide a low-cost option well suited to many sites. The goal of phytoremediation is to increase the remediation rate and to lower the contaminant concentration to an acceptable level.

As environmental control costs spiral and penalties for errors of judgment become more severe, environmental quality management increasingly needs analytical tools founded in an understanding of the processes affecting that quality. The extreme complexity of soil-plant-microbe system makes it apparent that the use of simulation models to help summarize and interpret experimental results, and provide a means of transferring experimental results to unstudied situations, is an important aspect of the growing field of phytoremediation. Thus the proposed research is intended to assess the potential of phytoremediation for clean up of petroleum contaminated soil through carefully designed laboratory, field, and mathematical modeling efforts. The research consists of two experimental components that will provide validation data for the modeling study. First, we will survey and collect plant species currently growing on contaminated sites and assess the plants and rhizosphere microorganisms for their ability to enhance biodegradation of petroleum contaminants in laboratory and greenhouse studies. Using information from the on-site survey and data from the other studies, we will conduct field studies to evaluate the appropriate plants and management systems to enhance phytoremediation of petroleum-contaminated sites.

When completed, the research will provide guidance in the management of phytoremediation projects nationwide.

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Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final Report

How Do Chemicals in Diesel Engine Exhaust Damage DNA?

EPA Grant Number: R828112C046
Subproject: *this is subproject number 046 , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).*
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: How Do Chemicals in Diesel Engine Exhaust Damage DNA?
Investigators: Frederick A. Beland
Institution: University of Arkansas for Medical Sciences
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Particles and Diesel Engine Exhaust

Approach:

Dr. Beland used state-of-the-art techniques to study DNA adducts formed from 1-nitropyrene under different conditions of exposure, with an emphasis on identifying unique adducts that had not been recognized before. First, he synthesized metabolites (products of biotransformation) of 1-nitropyrene that might form naturally in living cells. He then characterized the kinds of adducts found when these metabolites were combined with DNA in a test tube or with animal cells in culture. This information indicated which metabolic pathways might be important for the carcinogenic activity of 1-nitropyrene. He also studied the types of DNA adducts formed in rat and mouse organs in which tumors have been found after 1-nitropyrene treatment.

Objective:

High doses of inhaled diesel engine exhaust cause cancer in laboratory animals. Because of potential risks to human health, The Clean Air Act Amendments of 1990 require reductions in diesel engine emissions from motor vehicles.

Many chemicals in diesel engine exhaust can damage DNA, the material that controls the growth and development of living cells. This damage could lead to the unregulated growth of cells and possibly result in cancer. One early step in cancer development is thought to be the transformation of some chemicals, such as those found in diesel-engine exhaust, into substances that react with DNA. These combinations of chemicals and DNA, known as DNA adducts, may change the genetic message and lead to cancer. Identifying and measuring DNA adducts are important because that should permit scientists to estimate the uptake of diesel engine exhaust material by individuals. Before researchers can properly interpret the levels of DNA adducts in humans, more information is needed on how, which, and how many adducts are formed in laboratory animals after exposure to these chemicals.

Progress and Final Reports:

Final Report:

Nitropyrenes are a class of chemicals found in diesel engine exhaust that can form DNA adducts and are suspected animal carcinogens. If nitropyrene adducts could be measured in humans, they might provide information on the level of diesel material deposited in the lungs of humans and, perhaps, permit estimates of risk to human health from this exposure. The Health Effects Institute sponsored the study, summarized here, to examine the relationship between DNA adducts and cancer in laboratory animals treated with 1-nitropyrene, the major nitropyrene present in diesel engine exhaust.

Summary/Accomplishments:

When either animal cells or DNA were treated with the 1-nitropyrene metabolites in the test tube, unique DNA adducts were detected. However, when rats and mice were treated with 1-nitropyrene at doses that cause cancer, those DNA adducts found in the test tubes and cultured cells were not found in the animals' tissues. In addition, some of the adducts that were found in the animals may have been derived from trace amounts of dinitropyrenes, other potent cancer-causing members of the nitropyrene family that contaminated the 1-nitropyrene sample. Dinitropyrenes are also found in diesel engine exhaust and other emissions, but at much lower concentration than 1-nitropyrene. Because dinitropyrene adducts are formed so efficiently from trace amounts of the parent compound, these adducts may be more reliable indicators of the amounts of diesel engine emissions deposited in human lungs than 1-nitropyrene adducts.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: Not Applicable

Note: The Health Effects Institute itself is not located in Region 6, but it has quite a few subprojects that involve organizations within Region 6. For that reason, the main HEI page is included here as a reference for their mission and funding level.

Health Effects Institute

EPA Grant Number: R828112
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Health Effects Institute
Investigators: Daniel Greenbaum
Institution: Health Effects Institute
EPA Project Officer: Stacey Katz
Project Period: April 1, 2000 through March 31, 2005
Project Amount: $18,750,000
Research Category: Health Effects Institute

Description:

The Health Effects Institute (HEI) is an independent, nonprofit corporation chartered in 1980 to provide high-quality, impartial, and relevant science on the health effects of pollutants from motor vehicles and from other sources in the environment. Supported jointly by the U.S. Environmental Protection Agency (EPA) and industry (manufacturers and marketers of motor vehicles or engines), HEI has funded over 170 studies and published over 100 Research Reports, and several Special Reports, producing important research findings on the health effects of a variety of pollutants, including carbon monoxide, methanol and aldehydes, nitrogen oxides, diesel exhaust, ozone, and most recently, particulate air pollution.

HEI has also been called upon periodically to produce special reports reviewing an entire area of scientific literature on topics such as the health effects of asbestos, diesel exhaust, and oxygenates in fuel.

To accomplish its mission, HEI:
- Identifies the highest priority areas for health effects research;
- Funds and oversees the conduct of high-quality research in these priority areas;
- Provides intensive, independent review of HEI-supported and related research;
- Integrates HEI's research results with those of other institutions into coherent, broader evaluations of health effects; and Communicates the results of HEI research and analyses to public and private decision makers.

The HEI research program has addressed questions about the health effects associated with exposure to both regulated pollutants such as carbon monoxide, ozone, and nitrogen dioxide, and unregulated pollutants such as diesel exhaust, aldehydes, and methanol. HEI has also funded studies to understand the mechanisms of diseases, to develop better methods to assess health effects and determine dose response relationships. The program has included theoretical, in vitro, animal, controlled human exposure, and epidemiological studies.

The center has conducted research in several areas, including: Mobile Source Air toxics - which includes research on benzene and 1,3-butadiene, mechanisms of carcinogenicity and biomarkers of dose and effect, and the health effects of aldehydes; Oxygenated Fuels - the comparative metabolism and health effects of ethers used to increase gasoline oxygen content (MTBE); and Particulates - health effects of particulate air pollution and potential relationship to increased daily mortality.

HEI's Board of Directors, chaired by Richard Celeste, consists of public figures in science and policy who are committed to the public-private partnership that is central to the HEI approach. The Institute's scientific work is overseen by two independent scientific committees. The Health Research Committee works with the Institute's scientific staff to develop and manage HEI's research program. The Health Review Committee which has no role in selecting or overseeing studies, works with the Institute's scientific staff to evaluate and interpret the results of HEI studies and related research. HEI's priorities for research and special reviews are guided by the five-year HEI Strategic Plan , which is reviewed and updated annually after consultations with HEI sponsors and other interested parties.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Does Ozone Cause Precancerous Changes in Cells?

EPA Grant Number: R828112C050
Subproject: this is subproject number 050 , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Does Ozone Cause Precancerous Changes in Cells?
Investigators: David G. Thomassen, Jack Harkema, James D. Sun, Nicole D Stephens,. William C Griffith -
Institution: Lovelace Biomedical & Environmental Research Institute
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Ozone

Description:

Epithelial cells line the airways of the lung. Because most human cancers arise from epithelial cells, researchers frequently study the changes induced when these cells are treated with carcinogens (cancer-causing agents). Dr. David Thomassen and coworkers examined the ability of ozone to alter the structure and growth characteristics of epithelial cells from rat tracheas in ways consistent with precancerous changes. The frequency of such alterations was counted in rat tracheal epithelial cells exposed in culture under various conditions: a single 40-minute exposure to ozone (0.7 or 10 ppm), multiple ozone exposures (0.7 ppm, twice weekly for five weeks), or exposure to ozone (0.7 ppm) either before or after treatment with the known chemical carcinogen MNNG. Such alterations were also counted in tracheal epithelial cells removed from rats exposed to ozone (0.12, 0.5 or 1 ppm) for six hours per day, five days per week, for one to four weeks.

Ozone is a major component of urban smog. It is a highly reactive gas formed when emissions from mobile and industrial sources react in the presence of sunlight. The current National Ambient Air Quality Standard for ozone is 0.12 parts per million (ppm), and compliance requires that this level not be exceeded for more than one hour once per year. Presently, at least one-third of the population of the United States lives in areas that do not comply with the ozone standard.

In addition to concerns about the effects of ozone on lung function, researchers have questioned whether ozone has the potential to produce changes in airway cells that could result in cancer. The Health Effects Institute sponsored the present study to determine whether ozone exposure might influence a critical step in the development of lung cancer by increasing the frequency of early, precancerous changes in cells.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2314/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Nitrogen Dioxide and Respiratory Illness in Children

EPA Grant Number: R828112C058
Subproject: this is subproject number 058 , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Nitrogen Dioxide and Respiratory Illness in Children
Investigators: Jonathan M. Samet, John D. Spengler, William L. Lambert, Betty J. Skipper, Alice H. Cushing, William C. Hunt, Stephen A. Young, Leroy C. McLaren, Margo Schwab, William E. Lambert
Institution: Harvard School of Public Health , University of New Mexico
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Nitrogen Dioxide and Nitric Oxide

Description:

Drs. Jonathan M. Samet, John D. Spengler, and colleagues conducted a prospective investigation of 1,205 health infants living in homes with gas or electric stoves in Albuquerque, NM. Nitrogen dioxide exposures were carefully estimated from repeated measurements in multiple locations in the subjects' homes throughout the entire 18-month observation period. Respiratory illnesses were monitored prospectively using a surveillance system based on daily parental diaries of respiratory signs and symptoms. Parental reports of illness episodes were validated in a subset of the population by comparison with clinical diagnoses and microbiological testing. Potential confounding factors that influence respiratory infections were reduced by selecting subjects whose parents did not smoke or intend to use day-care services outside the home. Rigorous quality assurance procedures were implemented in all phases of the experimental protocol.

Nitrogen dioxide, a common indoor and outdoor air pollutant, is a by-product of high-temperature combustion. Motor vehicles and power plants are primarily responsible for the nitrogen dioxide in outdoor air. the U.S. Environmental Protection Agency, which establishes National Ambient Air Quality Standards (NAAQS) for nitrogen dioxide and other air pollutants, has set the NAAQS for nitrogen dioxide as an annual average of 53 parts per billion (ppb) (100 µg/m3). Although the annual average concentrations of nitrogen dioxide are well below 50 ppb in most regions of the United States, the standard is exceeded in areas of southern California, and short-term peaks of 100 ppb, and occasionally 200 ppb, occur in urban areas.

Indoor levels of nitrogen dioxide are often higher than outdoor concentrations, especially in homes where there are unvented heating and cooking appliances that utilize natural gas, kerosene, coal, or wood. Such exposures are of concern because some studies suggest that children exposed to nitrogen dioxide have more respiratory illnesses than those who are not exposed.

Although mild respiratory illnesses in infants and young children are quite common, more serious illnesses can be life-threatening and might increase the risk of developing lung disease later in life. The epidemiologic studies that have examined the role of nitrogen dioxide in childhood respiratory disease have produced inconsistent results, partly because of the difficulty of assessing exposures and measuring respiratory illness in a community setting. This study was conducted to address the limitations of previous studies and to help resolve whether exposure to nitrogen dioxide increases the incidence of duration, or both, or respiratory illness in infants.

Progress and Final Reports:

Final Report
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2321/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Noninvasive Methods for Measuring Ventilation in Mobile Subjects

EPA Grant Number: R828112C059
Subproject: this is subproject number 059 , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Noninvasive Methods for Measuring Ventilation in Mobile Subjects
Investigators: F. Dennis McCool, Jonathan M. Samet, David S. James, Thomas W. Chick, Christine M. Mermier, Domyung Paek, William E. Lambert
Institution: Brown University , University of New Mexico
EPA Project Officer: Stacey Katz
Project Period: January 1, 1993 through December 31, 1993
Research Category: Pollutant Mixtures

Description:

Ventilation Estimated from Body Surface Displacement Measurements: Drs. Dennis McCool and Domyung Paek measured ventilation with a body surface displacement (BSD) model. Each subject wore wide elastic bands containing coated wire coils around the chest and abdomen and had special magnets affixed to the breastbone and navel. changes in electrical signals from these devices indicated dimensional changes in the subject's body that were associated with breathing. After the BSD signals were calibrated with data from a spirometer (standard equipment for measuring breathing parameters), subsequent BSD measurements yielded data about a subject's breathing patterns, breath frequency, and ventilation. In laboratory studies, the investigators compared BSD data from 10 subjects with spirometric data obtained during upper and lower body work tasks, including lifting, pulling, and cycling. They also examined the influence of a spirometer mouthpiece on ventilation measurements. To evaluate the feasibility of using heart rate to predict ventilation, the investigators first plotted a ventilation?heart rate calibration curve for each subject based on data from a progressive exertion cycling test. They then used this curve to estimate ventilation from heart rate data alone, and compared these ventilation data with ventilation data obtained by BSD and spirometry. Finally, they tested their BSD model in a field study by monitoring nine vocational school students. The BSD equipment was placed on a cart to facilitate mobility of the tethered subjects during a classroom session and an auto body repair workshop session.

The laboratory data demonstrated that the BSD model provided ventilation data comparable to spirometry data. The specific work task influenced statistical correlations between BSD and spirometric data. Rhythmic breathing during cycling correlated the best, whereas erratic breathing during lifting correlated the worst. The investigators verified previous reports that the presence of a mouthpiece increases the volume of air inhaled per breath and decreases breath frequency. They also concluded that heart rate can be an inaccurate predictor of ventilation during the low activity levels that constitute much of daily life; transient ventilation increases detected by BSD or spirometry during low activity were not matched by similar increases in heart rate. Finally, the investigators' field study demonstrated the feasibility of using the BSD model to measure ventilation accurately and noninvasively in mobile subjects.

Ventilation Estimated from Heart Rate: Dr. Jonathan Samet and colleagues wanted to develop methods for estimating ventilation from heart rate for future epidemiologic studies. Their 58 subjects included healthy adults and children, and adults with heart disease, lung disease, or asthma. First, the investigators collected spirometric and heart monitor data in the laboratory to plot ventilation?heart rate curves for each subject during cycling, vacuuming, and lifting. They then used heart monitor data to validate the accuracy of the Heartwatch, a portable, commercial device combining a small transmitter worn on the subject's chest with a wristwatch-style receiver that records heart rate. Because route of breathing affects lung pollutant dose, they also used a partitioned face mask to determine the proportion of oral versus nasal breathing during exercise. with increased oral breathing during exercise, some inhaled air bypasses the air-scrubbing mechanisms in the nasal passages and can increase pollutant dose to the lower respiratory tract. Finally, the investigators conducted a field study to estimate ventilation from Heartwatch data using a heart rate?ventilation calibration curve from a progressive exertion cycling test; they then categorized these ventilation data by activity using records maintained by the subjects.

Data from the laboratory studies indicated that ventilation increased faster than heart rate when subjects performed upper body exercise compared with lower body exercise. Because most daily activities do not involve upper body exertion, the investigators concluded that heart rate could be used to estimate ventilation in field studies. Predictably, they reported that most subjects shifted from nasal to oral breathing with increasing exercise intensity. Using Heartwatch data from their field study, the investigators provided ventilation estimates categorized according to subject age, gender, health status, and activities. Dr. Samet and colleagues concluded that heart rate monitoring presents a feasible approach for estimating ventilation in the community setting.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2322/report/F

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Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Effects of Prolonged Ozone Inhalation on Collagen Structure and Content in Rat Lungs

EPA Grant Number: R828112C065
Subproject: this is subproject number 065 , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Effects of Prolonged Ozone Inhalation on Collagen Structure and Content in Rat Lungs
Investigators: Jerold A. Last, Jack Harkema, Thomas R. Gelzleichter, Susan Hawk
Institution: Lovelace Biomedical & Environmental Research Institute , University of California - Davis
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Ozone

Description:

Dr. Jerold Last and coworkers used biochemical methods to quantify total collagen and specific collagen cross-links in lung lobes from male and female rats exposed for twenty months to 0, 0.12, 0.50, and 1.0 ppm ozone. Dr. Jack Harkema (another investigator in the NTP/HEI Collaborative Project) studied the increases in collagen deposits at specific sites in the rats' lungs.

Ozone is highly reactive gas that forms when emissions from mobile and industrial sources react chemically in the presence of sunlight. It is the major component of urban smog. The U.S. Environmental Protection Agency sets a National Ambient Air Quality Standard (NAAQS) for ozone based largely on scientific data documenting its effects on lung function in humans. The current NAAQS is 0.12 parts per million (ppm); compliance requires that this level not be exceeded for more than one hour, once per year.

Because ozone has the capacity to damage cells, exposure to ozone as a risk factor for lung cancer is a major concern. Because this is an important public health issue, the National Toxicology Program (NTP) conducted a series of tests to evaluate ozone's carcinogenicity in rats and mice chronically exposed to this pollutant. This presented a unique opportunity to study ozone's noncancerous effects as well; therefore, the NTP and the HEI entered into a collaborative agreement. HEI-funded investigators studied whether long-term ozone exposure causes or enhances alterations that are characteristic of chronic lung diseases, such as fibrosis or emphysema, in the lungs of laboratory animals.

Pulmonary fibrosis results when chronic inflammation in the lungs increases deposits of the components of connective tissue, including collagen. The collagens are a family of proteins, some of which join to form large fibers. Their structure is stabilized by cross-links within and between individual collagen molecules. Connective tissue normally confers mechanical strength to the lungs by providing a supporting framework for cells; however, increased collagen deposits destroy normal lung structure, and decrease the lung's effectiveness for exchanging gases.

The study of the effects of long-term ozone exposure on lung collagen, described in this report, was one of eight studies in a Collaborative Project supported by the NTP and the HEI. The others included studies of lung biochemistry, structure, and function, and one study of nasal structure and function.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2328/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Changes in Complex Carbohydrate Content and Structure in Rat Lungs Caused by Prolonged Ozone Inhalation

EPA Grant Number: R828112C065III
Subproject: this is subproject number 065III , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Changes in Complex Carbohydrate Content and Structure in Rat Lungs Caused by Prolonged Ozone Inhalation
Investigators: Bhandaru Radhakrishnamurthy
Institution: Tulane University of Louisiana
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Ozone

Description:

Dr. Bhandaru Radhakrishnamurthy used standard biochemical methods to measure changes in the content, structure, and function of complex carbohydrates in lung tissue from male and female rats exposed to 0, 0.12, 0.5, and 1.0 ppm ozone for 20 months.

Ozone is formed when emissions from mobile and industrial sources react in the presence of sunlight. It is a highly reactive gas, and the major component of urban smog. Because inhaling ozone affects lung function in humans, the U.S. Environmental Protection Agency has set a National Ambient Air Quality Standard (NAAQS) for this pollutant. The current NAAQS is 0.12 parts per million (ppm); compliance requires that this level not be exceeded for more than one hour, once per year.

Because of ozone's reactive nature, prolonged or repeated exposure to ozone is thought to be a potential risk factor for lung cancer. This concern prompted the National Toxicology Program (NTP) to conduct a bioassay of prolonged exposure to evaluate ozone's carcinogenicity in rats and mice. Another concern is that long-term exposure to ozone may injure the tissues of the respiratory tract, and lead to the development or exacerbation of chronic lung diseases such as fibrosis and emphysema. To examine this hypothesis, the NTP allotted additional animals to investigators funded by the Health Effects Institute to study noncancerous alterations in lung tissue, structure, and function that are characteristic of chronic lung diseases.

One characteristic of the early stages of chemically induced fibrosis and emphysema in laboratory animals is an increase in the level of complex carbohydrates (a heterogeneous group of carbohydrate-containing polymers) in lung connective tissue. Connective tissue is important because it confers mechanical strength to the lungs by providing a supporting framework for cells; however, increased connective tissue can distort normal lung structure and decrease the lung's efficiency for gas exchange. The study of the effects of long-term ozone exposure on lung complex carbohydrates, described in this report, was one of eight laboratory studies supported by the NTP/HEI collaborative agreement. In addition to studying lung and nasal structure and function, investigators studied other constituents of lung connective tissue.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Pulmonary Function Alterations in Rats After Chronic Ozone Inhalation

EPA Grant Number: R828112C065V
Subproject: this is subproject number 065V , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Pulmonary Function Alterations in Rats After Chronic Ozone Inhalation
Investigators: Jack Harkema, Joe L. Mauderly
Institution: Lovelace Biomedical & Environmental Research Institute
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Ozone

Description:

Drs. Harkema and Mauderly exposed 65 male and female F344/N rats to either 0.12 ppm, 0.5 ppm, or 1.0 ppm ozone for 7 hours/day, 5 days/week, for 20 months, and investigated the effects of this exposure on lung function. Within one to six days after completing the 20-month exposure, they performed a battery of pulmonary function tests on anesthetized rats. Rats exposed to filtered air free of ozone served as a control group. The investigators' goal was to characterize the nature and magnitude of pulmonary impairment that may be associated with chronic exposure to ozone.

Testing pulmonary function in laboratory animals is a sensitive procedure for detecting lung injury and physiological changes related to disease. In humans, pulmonary function testing is critical to evaluating lung abnormalities in a variety of clinical and subclinical disease states. In fact, alterations in pulmonary function are commonly seen in humans who have been exposed to ozone. Therefore, the availability of benchmark data on pulmonary function in this rat cohort was considered to be essential to the overall interpretation of the other seven NTP/HEI studies.

Ozone is the major pollutant in smog. It is formed by complex photochemical reactions between nitrogen oxides and volatile organic compounds in the presence of sunlight. Motor vehicle and industrial emissions are prominent sources of these compounds. Peak atmospheric ozone concentrations generally occur during the summer months because the photochemical reactions that produce ozone are enhanced by sunlight and high temperature. Ozone exposure is a major health concern because it is a highly reactive gas that, at sufficiently high concentrations, can injure cells and tissues. Because ozone has the capacity to damage cells, exposure to ozone as a risk factor for lung cancer is an important public health issue. Therefore, the National Toxicology Program (NTP) conducted a series of tests to evaluate ozone's carcinogenicity in rats and mice chronically exposed to this pollutant. This presented a unique opportunity to study ozone's noncancerous effects as well; therefore, the NTP and the HEI entered into a collaborative agreement. HEI-funded investigators studied whether long-term ozone exposure causes or enhances alterations that are characteristic of chronic lung diseases, such as fibrosis or emphysema, in the lungs of laboratory animals.

The current National Ambient Air Quality Standard for ozone is 0.12 parts per million (ppm), a level that is not to be exceeded for more than one hour once a year. This standard was established largely on the basis of results of studies of acute exposure in human subjects. In exercising young adults, exposure to elevated levels of ozone for relatively short time periods causes lung function to be temporarily reduced and markers of pulmonary inflammation to appear in the fluid used to wash cells and other materials from the lungs. Whether repeated inhalation of ozone produces long-term effects on lung function, potentially causing or aggravating chronic lung disease, is unknown.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose

EPA Grant Number: R828112C065VII
Subproject: this is subproject number 065VII , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Prolonged Ozone Exposure Leads to Functional and Structural Changes in the Rat Nose
Investigators: Jack Harkema, Paul Catalano, William C. Griffith, Kevin T. Morgan, Elizabeth A. Gross
Institution: Lovelace Biomedical & Environmental Research Institute
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Ozone

Description:

Drs. Harkema and Morgan and their colleagues used a video recording technique to measure the speed of mucous flow in different regions of the nasal cavities of rats exposed to 0, 0.12, 0.50, or 1.0 ppm ozone for six hours per day, five days per week, for 20 months. The investigators used specific stains and a technique called image analysis to determine the effect of ozone exposure on mucous content, and light and electron microscopy to study cellular changes in the epithelial cell layer.

Ozone, a common outdoor air pollutant is a highly reactive gas and a major component of smog. The U.S. Environmental Protection Agency (EPA) has set a National Ambient Air Quality Standard for ozone of 0.12 parts per million [ppm] that should not be exceeded for more than one hour, once per year. This standard is based largely on scientific data documenting the effects of short-term exposure on lung function in humans. The standard is currently being reevaluated by the EPA.

Because ozone can damage cells, prolonged or repeated exposures may be a risk factor for lung cancer. To assess this issue, the National Toxicology Program (NTP) conducted an animal bioassay to evaluate ozone's carcinogenicity in rodents. Another public health concern is that prolonged exposure to ozone may damage the cells that line the airways, leading to functional changes in the components of the respiratory tract.

The nose is the first line of defense against inhaled pathogens, dusts, and irritant gases; thus, changes induced by ozone in the normal functions of the nose could result in an increased susceptibility to respiratory infections and other diseases. Mucous flow is critical to a defense mechanism called mucociliary clearance. Inhaled pathogens or irritants are trapped in mucus, which is removed (or cleared) by the beating of cilia, which are tiny hair-like projections on cells that line the airways and extend into the mucous layer. Short-term exposure to high concentrations of ozone is known to damage the epithelial cells that line the nasal passages of laboratory rats; however, the effects of prolonged ozone exposures are not known, nor is there information on the impact of such exposures on nasal function. Dr. Jack Harkema's study, which was one of eight studies in the NTP/HEI Collaborative Ozone Project, was conducted to address these issues. Other studies in this project investigated possible changes in lung function, structure, and biochemistry, and are being published as other Parts of Research Report Number 65.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Interactive Effects of Nitropyrenes in Diesel Exhaust

EPA Grant Number: R828112C066
Subproject: this is subproject number 066 , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Interactive Effects of Nitropyrenes in Diesel Exhaust
Investigators: Paul C. Howard, Frederick A Beland
Institution: Case Western Reserve University , University of Arkansas for Medical Sciences
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Particles and Diesel Engine Exhaust

Description:

Dr. Howard and colleagues conducted a pilot study using two approaches to examine the effects of pyrene on the metabolism of nitropyrene. First, test tube studies were performed to determine the extent to which 1-nitropyrene metabolism was inhibited by pyrene and other pollutants. In the second series of experiments, laboratory mice were exposed to 1-nitropyrene or 1,6-dinitropyrene alone or in the presence of possible copollutants such as pyrene or other nitropyrenes. The urine and feces of the mice were examined for metabolites of 1-nitropyrene or 1,6-dinitropyrene. In addition, mouse liver DNA was examined using two techniques for measuring the presence of DNA adducts.

High doses of inhaled diesel engine exhaust produce lung tumors in laboratory animals and may cause cancer in humans. Because of the potential risks to human health, diesel exhaust emissions are regulated by the Clean Air Act.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2337/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs

EPA Grant Number: R828112C068I
Subproject: this is subproject number 068I , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Comparison of the Carcinogenicity of Diesel Exhaust and Carbon Black in Rat Lungs
Investigators: Joe L. Mauderly, K. J. Nikula,, E. B. Barr, Charles Mitchell, M. Burton Snipes, James A. Bond, I-Yiin Chang, Nancy A. Gillett, Antone L. Brooks, Steven A. Belinsky, William C. Griffith, David G. Thomassen, Yung-Sung Cheng, Rogene F. Henderson
Institution: Lovelace Biomedical & Environmental Research Institute
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Particles and Diesel Engine Exhaust

Description:

Investigators exposed F344/N rats to clean air or to one of two levels (2.5 or 6.5 mg of particles/m3 of diesel exhaust or air) of either emissions from a light-duty diesel engine or carbon black particles. The exposures lasted for 16 hours/day, 5 days/week, for 24 months. The carbon black particles were similar to the soot particles in the diesel engine exhaust; however, they contained markedly lower amounts of adsorbed organic compounds. Approximately 100 times less organic material could be extracted from carbon black than from diesel exhaust particles. Also, in contrast to extracts of diesel exhaust soot, carbon black extracts produced little or no response in bacterial mutagenicity assays. Thus, they served as a surrogate for diesel exhaust particles that are relatively free of mutagenic organic compounds. The investigators determined the number and types of tumors that formed in the rats, and assessed the possible contributions of a number of factors (such as tissue injury, or clearance or translocation of inhaled particles) known to be linked with the development and progression of lung cancer. They also ascertained whether the exposures resulted in the formation of DNA adducts (the products of chemicals or their metabolites reacting with the DNA) in lung tissue or in cells isolated from lungs.

Emissions from diesel engines are a complex mixture of gaseous vapors and soot particles. The soot particles are a public health concern because they are of a respirable size and contain organic compounds adsorbed onto their surfaces. Many of these compounds can damage the cellular genetic material (DNA), and have been shown to cause cancer in laboratory animals. A number of laboratories have demonstrated that inhaling high concentrations of diesel engine exhaust for a prolonged period of time causes lung tumors in rats. However, in the 1980s, questions were raised about which constituents of diesel engine exhaust (the soot particles, or their adsorbed organic compounds, or both) were responsible for this tumorigenic effect.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2339/report/F

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Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust

EPA Grant Number: R828112C068II
Subproject: this is subproject number 068II , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: An Investigation of DNA Damage in the Lungs of Rats Exposed to Diesel Exhaust
Investigators: Kurt Randerath, Joe L. Mauderly, Kim L. Putnam, Paige L. Williams, Erika Randerath
Institution: Baylor College of Medicine , Harvard School of Public Health , Lovelace Biomedical & Environmental Research Institute
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Particles and Diesel Engine Exhaust

Description:

Dr. Randerath's study was part of a large cancer bioassay conducted by Dr. Joe Mauderly and colleagues of the Inhalation Toxicology Research Institute (ITRI). The investigators exposed F344/N rats by inhalation to clean (filtered) air or to one of two concentrations of either diesel exhaust or carbon (2.5 or 6.5 mg of particles/m3 of test atmosphere). Carbon black particles were used because they are physically similar to diesel exhaust particles but have negligible amounts of organic compounds adsorbed onto their surfaces; therefore the effects of carbon black particles are assumed to be similar to the effects of diesel exhaust particles without the adsorbed organic compounds. (The results of the animal exposures, tumor bioassays, and measurements of noncancer endpoints that were conducted at ITRI can be found in Part I of this Report.) Both Dr. Randerath and Dr. Mauderly measured DNA adducts in lung tissue samples from rats exposed at ITRI for different periods of time to the test atmospheres. Dr. Randerath and colleagues also extracted the organic compounds from the diesel exhaust particles, applied the diesel exhaust extract to the skin of CD-1 mice, and looked for DNA adducts in the skin, lung, and heart tissues of these mice.

Emissions from diesel engines are a complex mixture of gaseous vapors and soot particles. The soot particles are a public health concern because they are of a respirable size and have hundreds of organic chemical compounds adsorbed onto their surfaces. Many of these compounds can damage the cellular genetic material (DNA) and are known or suspected carcinogens. Studies have demonstrated that inhalation of high concentrations of diesel exhaust induces lung tumors in laboratory rats, and scientists have proposed different mechanisms to explain the rat lung's response. One hypothesis is that the organic compounds on the particle surfaces interact with lung tissue DNA to form DNA adducts (because DNA adducts cause mutations, their formation is critical in initiating cancer). Another hypothesis is that prolonged exposure to high concentrations of diesel exhaust particles impairs normal lung-clearance mechanisms, resulting in inflammation, cell proliferation, and ultimately cancer. A third hypothesis is that the initiating action of the organic compounds and the promoting action of particle-induced inflammation and cell proliferation combined are responsible for the tumorigenic response.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2340/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

No Evidence For Genetic Mutations Found In Lung Tumors From Rats Exposed To Diesel Exhaust or Carbon Black

EPA Grant Number: R828112C068III
Subproject: this is subproject number 068III , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: No Evidence For Genetic Mutations Found In Lung Tumors From Rats Exposed To Diesel Exhaust or Carbon Black
Investigators: Steven A. Belinsky, K. J. Nikula, Deborah S. Swafford, Charles Mitchell
Institution: Lovelace Biomedical & Environmental Research Institute
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Particles and Diesel Engine Exhaust

Description:

Dr. Belinsky and his associates examined lung tumors from rats and applied molecular biology techniques to measure mutations in selected genes in the DNA from the tumors. Mutations in portions of the K-ras protooncogene and the p53 tumor suppressor gene were targeted for analysis because patterns of mutations in these genes previously have been associated with exposure to carcinogens in laboratory animals and humans.

Diesel engine exhaust contains gases and carbon particles that have many mutagenic or carcinogenic chemicals adsorbed onto them. Some epidemiologic studies suggest that workers exposed occupationally to diesel exhaust have an increased risk of lung cancer. Inhaling high concentrations of diesel exhaust causes lung cancer in rats when the particles accumulate in their lungs. Recent inhalation studies comparing diesel exhaust with carbon black particles (which contain little adsorbed organic material) indicate no differences in the kinds and numbers of lung tumors found in rats. Thus, in rats, lung cancer induced by diesel exhaust appears to be due to the particles themselves, and not to the adsorbed organic compounds.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2341/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

DNA Mutations in Rats Treated with a Carcinogen Present in Diesel Exhaust

EPA Grant Number: R828112C072
Subproject: this is subproject number 072 , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: DNA Mutations in Rats Treated with a Carcinogen Present in Diesel Exhaust
Investigators: Frederick A. Beland
Institution: University of Arkansas for Medical Sciences
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Particles and Diesel Engine Exhaust

Description:

Dr. Beland and his associates analyzed the mutations in a selected gene in spleen T lymphocytes from rats treated with 1,6-dinitropyrene under conditions that induced lung tumors at the highest dose tested. They also examined DNA adduct levels in lung and liver tissues and in spleen lymphocytes and white blood cells.

Diesel engine exhaust contains carbon particles and many chemicals that cause cancer in laboratory animals and mutations in cells in culture. Inhaling high doses of diesel exhaust for most of their lives produces lung cancer in rats. Moreover, some epidemiologic studies suggest that workers exposed to diesel exhaust have an increased risk of lung cancer. Although recent evidence indicates that the carbon particles themselves are largely responsible for the induction of lung cancer in rats, the chemicals adsorbed onto the carbon particles may still have an important role in the possible induction of lung cancer in humans by diesel exhaust.

When the mutagenic chemicals present in diesel exhaust are inhaled, the body metabolizes them into activated substances that damage DNA by reacting with it to form adducts. If this damage is not repaired by the cell before the DNA is replicated during cell division, mutations may be introduced that persist through future generations of cells. If it were possible to measure the numbers, kinds, and locations (or patterns) of mutations induced by these chemicals, scientists may then be able to develop a biomarker assay to assess environmental exposure to the mutagens in diesel exhaust.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2345/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

A Pilot Study of Potential Biomarkers of Ozone Exposure

EPA Grant Number: R828112C090
Subproject: this is subproject number 090 , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: A Pilot Study of Potential Biomarkers of Ozone Exposure
Investigators: Mark W. Frampton, William A. Pryor
Institution: Louisiana State University - Baton Rouge , University of Rochester School of Medicine and Dentistry
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Ozone

Description:

HEI supported Dr. William A. Pryor of Louisiana State University to develop methods for measuring ozone reaction products in in vitro models of lung lining fluids exposed to ozone and in lung fluids from rats exposed to ozone. During the study, Dr. Mark Frampton of the University of Rochester provided Pryor with lung fluids from humans exposed to air or ozone under controlled conditions. In the current pilot study, Pryor and colleagues analyzed these fluids for two aldehydes that are known to be ozone reaction products. This report describes the results of the collaborative study between Drs. Pryor and Frampton.

Ozone, a major constituent of smog and a lung airway irritant, induces transient declines in lung function and respiratory tract inflammation in some people. Studies with laboratory animals have demonstrated that pathologic and physiologic effects of ozone on the respiratory system depend on the dose and duration of exposure. Although sensitive and accurate methods are available to measure the levels of ozone in ambient air, no methods have been developed to determine the dose of ozone that reaches tissues in the respiratory tract. Such methods would aid researchers conducting clinical studies and those seeking to extrapolate the results of animal studies to humans.

Some inhaled pollutants react with tissue constituents to form products that can be measured in blood, urine, or other fluids and reflect the dose received by a tissue. These products are referred to as biomarkers of dose. No biomarkers for ozone exposure have been identified. Ozone is a highly reactive gas and is unlikely to penetrate far beyond the fluid that lines the lung?s epithelial cell layer. Ozone?s harmful effects are thought to be mediated by products of its reaction with components of the lining fluid and the epithelial cell membrane. These products include aldehydes which, although rapidly metabolized, can be toxic to cells. Thus, the levels of aldehydes in lung fluids may serve as biomarkers of the dose of ozone received by the lung.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2394/report/F

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Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites

EPA Grant Number: R828112C092
Subproject: this is subproject number 092 , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Cancer, Mutations, and Adducts in Rats and Mice Exposed to Butadiene and Its Metabolites
Investigators: Rogene F. Henderson, Vernon Walker, Leslie Recio, Ian A. Blair, James A. Swenberg
Institution: Chemical Industry Institute of Toxicology , Lovelace Respiratory
Research Institute: New York State Department of Health , University of North Carolina at Chapel Hill , University of Pennsylvania
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Air Toxics

Description:

When HEI's program was initiated, scientists knew that BD itself is not carcinogenic. Rather, BD is transformed to reactive metabolites that can bind to DNA (forming adducts), thus causing genetic mutations and possibly initiating the carcinogenic response. The role of individual metabolites in BD-induced carcinogenesis, however, was not known. Furthermore, the metabolites exist in more than one stereochemical (or three-dimensional) form. Because enzymes may react preferentially with a specific form, these stereochemical configurations may be important in species sensitivity. Some of the products from BD reacting with cellular DNA or proteins had been identified and considered for use as biomarkers of exposure or of a biologically effective dose. However, sensitive analytical methods needed to be developed and validated if these biomarkers were to be useful in animal or human studies.

The studies reported here were designed to advance our understanding of the roles of different metabolites in BD-induced carcinogenesis and of the differences in sensitivity among species, and to develop methods for identifying and measuring biomarkers. The investigators focused on two BD metabolites (1,2-epoxy-3-butene [BDO] and 1,2,3,4-diepoxybutane [BDO 2]) that researchers had suspected may play a role in BD carcinogenesis; they also developed information on other metabolites that may be important but had not been extensively studied. Dr. Rogene Henderson (Lovelace Respiratory Research Institute) exposed mice and rats to BDO 2 to determine whether these species differ in their carcinogenic response to this metabolite. Dr. Leslie Recio (Chemical Industry Institute of Toxicology) and Dr. Vernon Walker (New York State Department of Health) compared the mutagenicity of BD, BDO, and BDO 2 in mice and rats. Dr. Ian Blair (University of Pennsylvania) developed methods for measuring DNA adducts derived from BD metabolites in the tissues and urine of rats and mice with the goal of comparing the levels of adducts in the two species and identifying possible biomarkers. Dr. James Swenberg (University of North Carolina at Chapel Hill) developed a sensitive method for detecting adducts formed between BD metabolites and a blood protein (hemoglobin) and measured these adducts in animals and humans exposed to BD. The investigators shared tissues from animals that were exposed by inhalation to BD or its metabolites at either the Chemical Industry Institute of Toxicology or Lovelace Respiratory Research Institute and, in some cases, developed collaborative ventures.

1,3-Butadiene (BD) is an occupational and environmental pollutant that is widely used in the manufacture of resins, plastics, and synthetic rubber; it is also found in combustion emissions from motor vehicles, stationary sources, and cigarette smoke. Ambient exposures to BD (0.3 to 10 parts per billion [ppb]) are orders of magnitude lower than those that occur in occupational settings (10 to 300,000 ppb), but they are a public health concern because BD may be a human carcinogen. In the Clean Air Act Amendments of 1990, BD is listed as a hazardous air pollutant and a mobile-source toxic air pollutant. Moreover, worldwide regulatory interest has evolved in the potential health effects of occupational and ambient exposures to BD. Epidemiologic studies have suggested that workers occupationally exposed to BD have an increased incidence of cancers of the lymphatic system and of those organs and systems in the body that produce blood cells. Interpretation of these studies has been controversial, however, because of inconsistencies among the results and because some workers may have been exposed to other chemicals in addition to BD. In situations of such uncertainty, data from animal studies are often used to fill information gaps about humans by extrapolating findings from laboratory studies in which animals have been exposed to high doses of a chemical to situations in which human subjects have been exposed to low doses. Consequently, researchers have produced a large range of human cancer risk estimates for BD depending on which animal species and which data they used in their extrapolation models.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2396/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Penetration of Lung Lining and Clearance of Particles Containing Benzo[a]pyrene

EPA Grant Number: R828112C101
Subproject: this is subproject number 101 , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Penetration of Lung Lining and Clearance of Particles Containing Benzo[a]pyrene
Investigators: Per Gerde
Institution: Lovelace Respiratory Research Institute
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Particles and Diesel Engine Exhaust

Description:

The investigators removed most of the organic compounds from diesel exhaust particles and bound radiolabeled BaP to them as a surrogate for all PAHs. They exposed the lower respiratory tract of three dogs to the particles and measured the levels of particle-bound BaP and free BaP released from particles in the peripheral region of the lungs. After approximately six months, they exposed only the trachea to the particle-bound BaP for similar measurements and isolated peripheral lung tissue to measure the long-term stability of BaP on the particles.

Diesel exhaust is a mixture of gases and soot. Soot consists of carbon particles with bound inorganic salts, metals, and more than 450 organic compounds. The organic compounds include genotoxic polynuclear aromatic hydrocarbons (PAHs), such as benzo[a]pyrene (BaP), that cause cancer in laboratory animals. Soot inhalation is believed to be a possible contributor to lung cancer risk in occupationally exposed humans because it is readily inhaled and deposits in the lungs. Some researchers believe that PAHs must be released from soot and become bio-available before they exert genotoxicity. However, the fate of the PAHs and their role in the toxicity of diesel exhaust are not well understood.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2406/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Completed
Reports: Final

Metabolism of Ether Oxygenates Added to Gasoline

EPA Grant Number: R828112C102
Subproject: this is subproject number 102 , established and managed by the Center Director under grant R828112 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Health Effects Institute
Center Director: Daniel Greenbaum
Title: Metabolism of Ether Oxygenates Added to Gasoline
Investigators: Jun-Yan Hong, Janet M. Benson, Wolfgang Dekant
Institution: Lovelace Respiratory Research Institute, Robert Wood Johnson Medical School, University of Medicine and Dentistry of New Jersey
EPA Project Officer: Stacey Katz
Project Period:
Research Category: Fuels and Fuel Additives

Description:

The studies reported here were initiated to increase our knowledge of the metabolism of ether oxygenates in humans and other species. Dr Jun-Yan Hong (the University of Medicine and Dentistry of New Jersey ? Robert Wood Johnson Medical School) used rat and human liver cells to determine the relative contribution of different members of a family of liver enzymes (cytochrome P450 [CYP] isozymes) to the metabolism of MTBE, ETBE and TAME. Blood samples from human volunteers who reported that they were sensitive to the health effects of MTBE were examined by Hong and colleagues, in order to determine whether genetic variants of CYP isozymes were present. Dr Wolfgang Dekant (University of Wurzburg) exposed rats and human volunteers by inhalation to two concentrations of MTBE, ETBE or TAME in order to provide detailed data for interspecies comparison. He also exposed human volunteers by ingestion to MTBE or TAME to compare metabolic pathways after inhalation and ingestion of these compounds. Dr Janet Benson (Lovelace Respiratory Research Institute) exposed rats by inhalation to several concentrations of MTBE alone or to MTBE in combination with gasoline vapors in order to determine how the presence of gasoline affects the uptake, kinetics, metabolism and excretion of MTBE.

The Clean Air Act Amendments of 1990 required use of oxygenated fuels in areas that exceeded the National Ambient Air Quality Standards for carbon monoxide and in areas with very high ozone levels. Adding oxygenates, such as MTBE (methyl tert-butyl ether), to gasoline promotes more efficient combustion and reduces emission of carbon monoxide, ozone-forming hydrocarbons, and some air toxics, by increasing the oxygen content of the fuel. On the other hand, some oxygenates may increase emission of toxic compounds such as formaldehyde or acetaldehyde. Increased use of MTBE in fuel in the early 1990s led to complaints of unpleasant odor, headaches, and burning of eyes and throat. After reviewing the literature, HEI issued a request for applications to fund research on the comparative metabolism of ether oxygenates, such as MTBE, ETBE (ethyl tert-butyl ether), and TAME (tert-amyl methyl ether). The three studies funded are presented in this Research Report.

Progress and Final Reports:

Final Report is available at:
http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2407/report/F

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: See Subprojects

Gulf Coast Hazardous Substance Research Center (Lamar University)

EPA Grant Number: R828598
Center: Gulf Coast HSRC (Lamar)
Center Director: T. C. Ho
Title: Gulf Coast Hazardous Substance Research Center (Lamar University)
Investigators: T. C. Ho
Institution: Gulf Coast Hazardous Research Center
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Project Amount: $4,749,300
Research Category: Gulf Coast Hazardous Substance Research Center

Description:

The Gulf Coast Hazardous Substance Research Center (GCHSRC) was established in 1986 for the purpose of conducting research to provide more effective hazardous substance response and waste management throughout the Gulf Coast. The GCHSRC is comprised of eight member university consortium including: Lamar University-Beaumont, Louisiana State University, Mississippi State University, Texas A&M University, University of Alabama, University of Central Florida, University of Houston, and the University of Texas-Austin.

The Center's mission is to conduct an integrated research program to improve the quality of the environment in order to reduce risk to human and ecosystem health. The major emphasis of the center is on environmental technologies for pollution prevention, waste treatment, and site remediation for hazardous substances associated with petroleum, chemical and other Gulf Coast Industries. The center's research program concentrates n waste minimization, alternate treatment technology development, toxicity reduction, and other technology-support areas. The center's FY94 projects covered: soil and sludge treatment; separation technology; pollution prevention; modeling and risk assessment; combustion and oxidation technologies; monitoring and detection; and biological treatment technologies.

The center also operates a technology transfer program which involves compilation of a CDRom based environmental library; a technical list server; conferences/workshops on development of commercially viable industrial technologies; and short courses for methodology developed by the center.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Field Study Abstract: A Model of Ambient Air Pollution in Southeast Texas Using Artificial Neural Network Technology

EPA Grant Number: R828598C001
Subproject: this is subproject number 001 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Field Study Abstract: A Model of Ambient Air Pollution in Southeast Texas Using Artificial Neural Network Technology
Investigators: Anita L. Riddle, Jack R. Hopper
Institution: Lamar University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

This research project will create an artificial neural network- based model of ambient air pollution in Jefferson, Orange, and Hardin Counties, Texas. These counties are designated by EPA as "serious" non-attainment for ozone. The intent of the neural network model is to supplement the current Urban Airshed Model (UAM) by more efficiently replicating historical ozone episodes and more accurately predicting future ozone pollution episodes.

The current UAM provides only marginal results and research is desperately needed to alleviate the weaknesses in the UAM. A artificial neural network model may help. The types of problems which are most amenable to solution with artificial neural networks include building models of complex systems which are very difficult to express mathematically. Although relatively new, neural network technology has proven to be useful in data- rich environments, such as the process industries for process control and predictive modeling. It is in our best interest to attempt this method for air pollution modeling as well. Using historical air pollution and meteorological data, neural network- based software, and a computer work station, we may be able to derive the following benefits:

(1) Create a more accurate predictive model of ambient air pollution;

(2) Discover relationships between pollutants, atmospheric conditions, and ozone pollution;

(3) Publish results in a technical journal;

(4) Project emissions for some future year and estimate the impact of controls on future ambient ozone concentrations;

(5) Propose an effective means to eliminate the ozone excursions and achieve compliance with the Federal standard.

Artificial neural networks are among the most advanced technologies as well as one of the most cost effective means available for modeling complex processes. This project's concept, although now limited to modeling the atmosphere in Southeast Texas, if successful may be used to model atmospheric systems wherever atmospheric data are available.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Hollow Fiber Membrane Bioreactors for Treating Water and Air Streams Contaminated with Chlorinated Solvents

EPA Grant Number: R828598C002
Subproject: this is subproject number 002 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Hollow Fiber Membrane Bioreactors for Treating Water and Air Streams Contaminated with Chlorinated Solvents
Investigators: Gerald E. Speitel, George Georgiou
Institution: University of Texas
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Contamination of ground water and soils with chlorinated aliphatic solvents is a widespread problem. One promising approach for treating chlorinated solvents is to destroy them through cometabolism in aerobic biological processes. Cometabolism requires a supplemental carbon and energy source for the bacteria, as the chlorinated solvents do not meet this need. Some technologies based on cometabolism are in various stages of development now; however, these address only the relatively straightforward problems of water contaminated with chlorinated ethenes and mixed wastes that do not contain chemicals toxic to the organisms.

In this research, we will develop a new technology to address more challenging chlorinated solvent problems. The technology will treat chlorinated methanes and ethanes, in addition to ethenes, will handle mixed wastes containing chemicals that are toxic to the organisms, and will be applicable to both contaminated water and air streams. This new technology is based on a specialized, patented methane-degrading bacteria developed in our laboratory and on a new type of bioreactor, a hollow fiber membrane reactor. The bacteria were developed through classical mutagenesis techniques and can degrade chlorinated solvents at rapid rates under environmental conditions typical of practice. A hollow fiber membrane reactor provides a protective barrier between the organisms and the contaminated water or air because only volatile chemicals can cross the membrane. The reactor also allows a very high degree of control over the biological process so that maximum biodegradation rates can be obtained.

The overall objective of the research is the demonstration of successful performance in treating contaminated water streams through bench scale experiments with hollow fiber membrane systems. The second year of the project, which was just completed, focused on mass transfer kinetics, degradation kinetics of mixtures, and membrane fouling. The usefulness of a computer-based mathematical model for process design and operation also was evaluated. The third year of the project will focus on bioreactor experiments with contaminated aqueous streams containing single chemicals and mixtures of chlorinated solvents. The objective of these experiments is definition of appropriate design conditions and operating strategies. The utility of the computer simulation model will also be further evaluated. Hoechst Celanese will continue to participate in the project through donation of membrane reactors and related technical support.

Contamination of ground water and soils with chlorinated aliphatic solvents is a widespread problem. One promising approach for treating chlorinated solvents is to destroy them through cometabolism in aerobic biological processes. Cometabolism requires a supplemental carbon and energy source for the bacteria, as the chlorinated solvents do not meet this need. Some technologies based on cometabolism are in various stages of development now; however, these address only the relatively straightforward problems of water contaminated with chlorinated ethenes and mixed wastes that do not contain chemicals toxic to the organisms.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Fugitive Emissions of Hazardous Air Pollutants from On-Site Industrial Sewers

EPA Grant Number: R828598C003
Subproject: this is subproject number 003 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Fugitive Emissions of Hazardous Air Pollutants from On-Site Industrial Sewers
Investigators: Richard L. Corsi
Institution: University of Texas
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

As a result of the Clean Air Act of 1990, several industries have come under increased regulatory scrutiny as sources of hazardous air pollutant (HAP) emissions. For example, over the next several years the Environmental Protection Agency will propose and eventually implement National Emission Standards for Hazardous Air Pollutants (NESHAPs) for 189 HAPs emitted from 174 industrial source categories. One fugitive emissions source that has received significant attention is process wastewater streams, particularly process drains.

The objectives of this research are all intended to facilitate the development of industry-specific NESHAPs based on an improved understanding of the mechanistic behavior of HAP emissions from on- site industrial sewers, and to provide a model which industry and regulators can use to investigate cost-effective means of controlling fugitive HAP emissions.

Specific objectives include (1) determination of the sensitivity of stripping efficiencies to HAP physicochemical properties, (2) determination of the sensitivity of HAP stripping efficiencies to variations in system operating conditions, including liquid flowrate, liquid temperature, and air exchange rates, (3) determination of the effects of water seals, i.e., J-traps, on HAP stripping efficiencies, and (4) development of a novel spreadsheet model that allows the estimation of

HAP stripping efficiencies as a function of a wide range of system operating conditions and HAP properties.

The objectives listed above will be achieved through the construction and use of a pilot drain system (PDS) that approximates a recirculating batch reactor. The PDS will allow flexibility in varying system operating conditions and HAP physicochemical properties. The influence of these properties will be studied experimentally using a cocktail of volatile tracers. The first two objectives will be completed by using a dynamic mass balance on a cocktail of volatile HAPs and dissolved oxygen. The third objective will be achieved by similar mass balances on a modified PDS which includes the incorporation of a J-trap in the drain throat.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Biofiltration Technology Development

EPA Grant Number: R828598C004
Subproject: this is subproject number 004 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Biofiltration Technology Development
Investigators: Raymond C. Loehr
Institution: University of Texas
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

The purpose of this project is to further the development and particularly the design of biofilter technology for use with volatile organic carbon compounds (VOC's) and odor containing gases. The studies being conducted as part of this project are extending previous research completed in our laboratory and incorporate data from several larger biofilters. This will allow us to determine lf the design factors and equations developed from laboratory reactors can describe conditions that occur in the "real world." Thus, results from this project are (a) extending the previous studies, (b) integrating data from laboratory, pilot scale, and full scale units, (c) sharpening the process relationships used for design, and (d) a more effective design for biofilters that will allow industries to meet VOC emission control requirements. Biofilters are a technology applicable to off-gases from processes used for Superfund site remediation, and thus the project is consistent with the mandated objectives of the GCHSRC.

This project started in September 1994. Therefore, this progress report summarizes the accomplishments that occurred in the first project year - September 1994 through August 1995.

In this first project year, we have (a) obtained industrial data from several sites, (b) begun laboratory studies using mixtures of VOCs, and (c) begun an evaluation of the differences of performance of plug flow and step-feed biofilters. The laboratory evaluations involved several 4" dia. biofilters that allow gas samples to be taken every 3" over a 4 ft height. Biofilters are packed bed plug flow reactors with a microbial catalyst. Experiments have been conducted with BTEX compounds and rapid first order VOC loss rates have been obtained. Studies also are underway evaluating the effect of pulsed (rapid) changes in VOC concentrations and mass loadings to the biofilters on VOC removal and process performance. One series of experiments has evaluated the availability and need for supplemental nitrogen when compost was used as the biofilter media.

In the second project year, the research will focus on (a) completing the evaluation of the performance of biofilters to treat mixtures of VOCs, (b) determining the difference in effectiveness of step feed and plug flow biofilters, (c) evaluating the data obtained in terms of process design parameters, such as empty bed contact time (EBCT) and mass loading, (d) identifying suitable relationships that can be used for biofilter design and performance estimation, and (e) developing one or more draft technical manuscripts for possible publication.

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Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

A Risk-Based Decision Analysis Approach for Aquifers Contaminated with DNAPLs

EPA Grant Number: R828598C005
Subproject: this is subproject number 005 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: A Risk-Based Decision Analysis Approach for Aquifers Contaminated with DNAPLs
Investigators: Daene C. McKinney, Robert B. Gilbert
Institution: University of Texas
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

We are requesting funding to implement a risk-based decision analysis approach for remediating aquifers contaminated with dense, nonaqueous-phase liquids (DNAPLs). Remediation of DNAPLs is an important research problem because DNAPLs pose a significant threat to aquifers and because they are extremely difficult to remediate. Sixty percent of Superfund sites with groundwater contamination contain DNAPLs. DNAPL contamination is difficult to detect and characterize. Conventional pump and treat remediation technologies are ineffective and costly for remediating DNAPLs. Other remedial alternatives, such natural attenuation and in-situ bioremediation, do not have a proven track record. Therefore, there are numerous uncertainties involved in developing site-assessment programs, selecting and designing remedial alternatives, establishing feasible performance criteria for remediation, and designing monitoring systems to confirm long-term performance. The objective of this research is to implement a decision analysis approach that provides the ability to account rationally for these uncertainties throughout the remediation process.

The proposed research effort will consist of six tasks: (1) compile case study information from sites with DNAPL contamination; (2) identify and assess uncertainties in the parameters that affect remediation performance; (3) compile and analyze data concerning investigation, remediation, and monitoring costs; (4) evaluate the uncertainty and bias associated with modeling transport and fate of DNAPLs in aquifers; (5) perform reliability analyses to evaluate the probability of success for different remedial alternatives; and (6) analyze risks and costs within a decision analysis framework to identify factors that affect feasibility and to optimize the value of information from investigation and monitoring programs.

This research will be completed within 3 years. The focus during the first year will be to identify and assess uncertainties that affect our ability to remediate aquifers contaminated with DNAPLs (Tasks 1, 2, 3 and 4). In the second year, we will continue this work and begin evaluating the reliability of alternative remediation schemes (Task 5). Work during the final year will involve the development of decision analysis tools for conducting feasibility studies and for optimizing investigation and monitoring programs (Task 6).

If successful, this research should improve our ability to make rational, cost-effective and defensible decisions in remediating aquifers contaminated with DNAPLs. Potential benefits will be to minimize the costs associated with investigating sites that potentially contain DNAPLs in the subsurface, facilitate implementation of innovative technologies such as in-situ bioremediation for addressing these problems, minimize the costs for remediating and monitoring contaminated sites, and integrate cost and feasibility considerations into the establishment of remediation performance standards.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

In-Situ Remediation for Contaminated Soils Using Prefabricated Vertical Drains

EPA Grant Number: R828598C006
Subproject: this is subproject number 006 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: In-Situ Remediation for Contaminated Soils Using Prefabricated Vertical Drains
Investigators: John J. Bowders, David E. Daniel
Institution: University of Texas
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Bioremediation, vacuum/air stripping and soil flushing can all be used for in-situ remediation of contaminated soils. However, each of these techniques can become less efficient or even ineffective in fine-grained soils or sludges. The extremely small pores in fine-grained soil and sludges limit the rate at which stripping or flushing agents can be delivered into or extracted from the soil. For bioremediation, the rate at which nutrients can be delivered to the contaminated areas is also limited by the pore sizes within the soil mass. It is typically preferable to remediate soils and groundwater in situ, thus a technique for extending these techniques to fine-grained soils and sludges and for improving their efficiency is needed.

Prefabricated vertical drains (PVD's), also known as strip or wick drains, provide a technique for enhancing the performance of in-situ bioremediation, vacuum/air stripping and soil flushing. PV-drains can be used to decrease the flow path and subsequently shorten the travel time between the areas of injection or extraction and the location of the contaminated soil or pore water. PV-drains also offer the advantage of multiple injection and/or extraction wells to intercept isolated pockets of contaminant and provide redundancy for increasing confidence of contaminant capture.

The objective of the proposed research is to verify this technology for enhancing in situ treatment. Promising results were found in earlier work, and a model for predicting the efficiency of PV-drain injection- recovery systems for remediating contaminated, fine-grained soils or sludges was developed. Parametric analyses have been performed; however, the results of the model have not been verified with physical data. The work being proposed is to develop the techniques and collect the data required to verify the PV-drain technology and the model. In the laboratory phase, techniques will be developed and data will be collected for verifying the PV-drain technology and model at the bench scale. The verified model and data collected will be used to design a field demonstration of the PV-drain technology for in-situ remediation of a contaminated soil or sludge.

The project is scheduled for a 3-year duration. The first 18 months are devoted to the laboratory phase and the second 18 months for the field demonstration. The field demonstration will be conducted with an industrial partner to be determined during the second year of the project. The project will terminate after 2 years if a partner is not identified. Current technologies for in situ remediation of fine-grained soils are non-existent. However, for a hypothetical site - 5 acres in area, 20 feet in depth, hydraulic conductivity lE-06 cm/s - the cost of materials and installation of drains and a manifold system would approach $1/yd3 of soil. It would require about 1.5 years to completely flush the pores assuming a porosity of 0.3. Pumping and treatment costs of the extracted fluids must be considered in addition and will vary greatly dependent upon the nature of the contaminants. The potential cost savings from this technology are very large.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Membrane Technology Selection System for the Metal Finishing Industry

EPA Grant Number: R828598C007
Subproject: this is subproject number 007 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Membrane Technology Selection System for the Metal Finishing Industry
Investigators: Miriam Heller
Institution: University of Houston , University of Texas at Houston
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

New technologies for waste minimization, recycling, and treatment are being commercialized at a rate that far exceeds their deployment in actual process design. This "implementation gap" has caught the attention of various industry groups. For instance, the American Institute of Chemical Engineers and the National Center for Manufacturing Sciences have determined that the gap must be bridged with automated conceptual design tools. The need for an initial design analysis tool to aid in technology selection has been recognized across industries.This research program focuses on a strategic subset of the industry-directed solution: a decision support tool for selecting membrane technologies in the metal finishing industry. Numerous membrane separation technologies have been commercialized that target metal recovery and water reuse to reduce wastes and also improve a metal finisher's bottom line.

Ultrafiltration costs undercut conventional separation technologies up to 50% for small systems, reverse osmosis applications result in an average return on investment (ROI) of 27% and payback in 2.7 years, electrodialysis for cadmium cyanide plating shows a 103% ROI. Yet membrane technologies remain rare in the industry.

The proposed decision support tool will enhance the optimal selection of membrane technologies by enabling comprehensive, consistent evaluation of design options at the cost of running a PC. Earlier design decisions lock in more total system benefits, so improved technology selection translates into the greatest benefits. Knowledge-based systems have been used for selecting separation technologies other than membranes. Membrane selection options include membrane material, cutoff, geometry, pretreatment, and configuration. Regulatory constraints, costs, recovery goals, waste stream characteristics, etc., structure these decisions. Software engineering methods for knowledge-based prototyping will be employed. Preliminary studies have confirmed system feasibility.

Future development phases include requirements analysis, logical design, software design, coding, testing, and validation. Key to the success of this system is the commitment of time, gratis, of a membrane technology expert, Dr. M. R. Wiesner. Knowledge acquisition will be an on-going process generating sequential system prototypes. The Kappa statistic will be employed to validate the system with multiple technology and industry experts to assure quality.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Stochastic Risk Assessment for Bioremediation

EPA Grant Number: R828598C012
Subproject: this is subproject number 012 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Stochastic Risk Assessment for Bioremediation
Investigators: Bill Batchelor, Juan B. Valdes
Institution: Texas A & M University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Sites contaminated with hazardous wastes show high levels of variability in the extent and distribution of contaminants; in the physical, chemical and biological characteristics of the site; and in performance of treatment technologies that can be applied to remediate the site. Therefore, stochastic tools that explicitly consider the variability at the site are needed to evaluate risks associated with the site and to effectively evaluate alternative technologies for remediation. Risk assessment is in particular need of stochastic approaches to avoid problems associated with deterministic risk assessments. These problems include excessive and unquantified levels of conservatism in estimating risk, and lack of recognition of the high variability associated with risk calculations. Bioremediation is a good technology for which to develop stochastic tools because of its increasingly wide acceptance.

The project is continuing development of risk assessment procedures for bioremediation. We have developed a stochastic risk assessment procedure and have applied it to calculate the distribution of risks at a site before remediation occurs. We are currently developing a stochastic model for bioremediation that will allow us to estimate the reduction of risk as a function of remediation time. After the current project year, we will have developed the framework of the stochastic bioremediation model, obtained information on the variability of bioremediation at sites, and begun development of stochastic descriptions of model parameters. Continuation of this project will allow incorporation of the bioremediation model with the risk assessment model and application of the model to evaluate risk reduction at sites. This will provide a tool for stochastically evaluating how risks at a site change as bioremediation is applied and thereby provide a means for determining how long the treatment period must last.

The project goal will be accomplished by completing five specific objectives. The first two will be completed and the third will commence during the current project year. The third, fourth, and fifth specific objectives will be completed during the proposed continuation project period.

Specific Objective 1 is to develop a framework for the stochastic bioremediation model. Two approaches for this model have been identified. A first-order decay model will provide a simple framework that can be used with little data from the site. A more complex model based on the Haldane kinetics will provide the framework for the model when sufficient data are available to characterize its additional parameters.

The second objective will be to obtain data on the variability of bioremediation. Two types of variability will be considered -- that resulting from the natural variability of the site and that resulting from interactions among the site characteristics and the processes of bioremediation. Information on the first type will be quantified by evaluating variability of treatability data for bioremediation. An example of the second type would be the effect of the variability of hydraulic conductivity in an aquifer on the ability to supply microorganisms with oxygen and nutrients. Scenarios for bioremediation in an aquifer and in a pond will be studied in quantifying such sources of variability.

The third objective will be to apply the data obtained on the variability of bioremediation to develop a stochastic description of the parameters in the stochastic bioremediation model.

The fourth objective will be to combine the bioremediation model with the risk assessment model. The bioremediation model will then be able to provide information on the variability of the contaminant concentration distribution so that the risk assessment model can calculate the distribution of expected risks and how they change during remediation.

The last objective will be to use the model to characterize how bioremediation processes reduce risk. Sensitivity analysis will be conducted to determine the major sources of variability in risk calculations.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Selective Removal of Heavy Metals from Wastewater by Chelation in Supercritical Fluids

EPA Grant Number: R828598C013
Subproject: this is subproject number 013 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Selective Removal of Heavy Metals from Wastewater by Chelation in Supercritical Fluids
Investigators: Aydin Akgerman, Can Erkey
Institution: Texas A & M University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

A wide variety of industries such as petroleum refining, chemical manufacturing, metal finishing, and printed circuit manufacturing create waste water streams that are polluted with heavy metals. Recent federal amendments to the Clean Water Act limit the metal concentrations that can be discharged from these industries. Therefore, there is a need to develop cost-effective and environmentally friendly processes to recover heavy metals from waste water streams.

The objective of this proposed study is to investigate the feasibility of a novel process for removing heavy metals from wastewater. In this process, the chelating agent of interest is dissolved in supercritical carbon dioxide and contacted with the waste water stream. The metal reacts with the chelating agent to form a metal chelate which transfers into the supercritical phase.

The main objective of the proposed study is to investigate the potential and feasibility of the proposed process. Specifically, we will measure the solubilities of various commercial chelating agents and metal-chelate complexes in supercritical carbon dioxide. Then, we will determine the distribution coefficients of various heavy metals between water and supercritical carbon dioxide that contains the chelating agent. This data will form the basis for designing a counter current extractor for assessment of the commercial potential of the process.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Optimization of Treatment Technologies for Detoxification of PCB Contaminated Soils

EPA Grant Number: R828598C014
Subproject: this is subproject number 014 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Optimization of Treatment Technologies for Detoxification of PCB Contaminated Soils
Investigators: Kirby C. Donnelly, Bruce E. Dale
Institution: Texas A & M University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

This proposal describes research to develop a procedure for remediation of soils contaminated with halogenated hydrocarbons. The research proposes to test, separately and in combination, a chemical process for reductive dehalogenation and a biological process for dehalogenation and oxidation. During the first year, an EPA permit was received and PCB contaminated soil was collected and characterized. In the third quarter, the tests were initiated in greenhouse boxes using an aged soil contaminated with polychlorinated biphenyls (PCBs). Chemical pretreatment was accomplished using a potassium polyethylene glycol reagent.

Biodegradation is being evaluated using pretreated soil and soils which have been inoculated with PCB- degrading Pseudomona sp. strain LB400. An uninoculated soil serves as a control, while replicated samples of an uncontaminated soil are extracted and analyzed as a field blank. Soils are extracted using methylene chloride and methanol on a Tecator Soxtec apparatus. The extracts are being analyzed for PCB congeners using GC and GC/MS; toxicity to microorganisms is measured using a plate count technique, and genetic and immunotoxicity are measured using in vitro bioassays. The degree of detoxification achieved by each treatment will be compared using standard risk assessment methodology and bioassay-based risk assessment.

The results from the study should define the most effective procedure for reducing the toxicity of PCB-contaminated soil.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Wastewater Remediation by Catalytic Wet Oxidation

EPA Grant Number: R828598C015
Subproject: this is subproject number 015 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Wastewater Remediation by Catalytic Wet Oxidation
Investigators: Aydin Akgerman
Institution: Texas A & M University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Although there are many established technologies for the treatment of dissolved organics in wastewater ranging from biodegradation to granulated activated carbon adsorption to photocatalytic oxidation, none is applicable to treatment of heavily contaminated waters (moderate to high levels of organic concentration) where the organic species may even be in a separate phase. Furthermore, most of these technologies result in a waste stream (such as sludge, contaminated carbon) that requires further treatment. In this study, we propose to evaluate the efficiency of catalytic wet oxidation as an alternative technology for the removal of organic compounds from aqueous waste streams. In this technology, the organics are converted into environmentally acceptable end-products, such as carbon dioxide and water, and thus no new form of waste is produced.

Catalytic wet oxidation provides an excellent alternative for the remediation of waste water streams containing organics. The first objective of this study was to evaluate catalyst activity and stability for use in wet oxidation in a batch reactor. Using phenol as the model compound, we have shown that platinum on titanium catalyst (Englehart) is the suitable catalyst for wet oxidation.

Reaction temperature and catalyst loading optimization studies have been completed and a kinetic model has been fit to experimental phenol disappearance data. Our second objective is to evaluate the catalysts for long periods on stream in a trickle bed reactor which will be optimized through the kinetic data obtained in the batch system. Finally, our third objective is to study model systems and actual refinery and/or chemical industry waste water streams in a laboratory scale trickle bed reactor in order to obtain sufficient data for design and cost estimates of an industrial scale catalytic wet oxidation process.

As model organic contaminants, we will use both polar and non-polar compounds such as hydrocarbons (toluene, tetralin), oxygenates (phenol, oils), chlorinated compounds (dichlorobenzene, chlorophenol). and nitro compounds (anilines, diazo compounds) in order to evaluate the effect of different functional groups on reaction by-products. In addition, we will use synthetic mixtures of these compounds as well as complex mixtures such as creosotes.

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Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Permanence of Metals Containment in Solidified and Stabilized Wastes

EPA Grant Number: R828598C016
Subproject: this is subproject number 016 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Permanence of Metals Containment in Solidified and Stabilized Wastes
Investigators: Larry P. Wilding, Bill Batchelor
Institution: Texas A & M University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Solidification/stabilization remediation technologies have been demonstrated to be an acceptable method of treatment for immobilizing heavy metals in contaminated soils and sludges. Despite the increased use of solidification/stabilization treatment processes, very little long- term research has been conducted on the mechanisms of contaminant containment. Effective use of solidification/stabilization processes requires improved knowledge of the chemical and physical alteration and degradation of solidified and stabilized wastes once the treated wastes have been landfilled. Mineralogic analyses of treated wastes that have been exposed to aging (weathering) will provide basic knowledge about chemical and physical degradation processes, the durability of solidified and stabilized wastes, and the permanence of metals containment in the treated wastes over time.

The objective of the proposed research is to continue work done under Project No. 103TAM0343 by further investigating the mineral phase- relationships in the treated waste samples through the use of transmission electron microscopy and electron microprobe analyses, in addition to the ongoing optical and scanning electron microscopy and X- ray diffraction analyses. Transmission electron microscopy is a vital tool in evaluating the submicron-sized and poorly crystallized materials present in the treated wastes. The electron microprobe will be used on appropriate samples of treated waste to illustrate grain boundary diffusion mechanics of ion sorption, and mineral transformations that occur as a result of aging. The additional submicroscopic analyses will enhance the ongoing study to evaluate the permanence of metals containment in solidified and stabilized wastes.

Practical benefits of the proposed research include (1) determination of the extent to which metals are permanently stabilized, providing valuable documentation of the long-term stability of solidified and stabilized wastes; (2) identification of mechanisms of chemical stabilization, including identification of controlling mineral phases when precipitation or dissolution occurs, providing documentation of important factors for developing theoretical leaching models; (3) generation of data upon which mechanisms for impermanence could be based, allowing the development of short-term tests with which to measure long-term solidification/stabilization performance; and (4) quantification of the extent of mixing achieved, allowing the evaluation of different mixing devices used to produce the treated wastes. In addition, direct field measurements could be incorporated into theoretical risk assessment models to provide more accurate long-term predictions.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Combustion Enhancement by Radial Jet Reattachment - Low Generation of Hazardous Gases and High Thermal Efficiency

EPA Grant Number: R828598C017
Subproject: this is subproject number 017 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Combustion Enhancement by Radial Jet Reattachment - Low Generation of Hazardous Gases and High Thermal Efficiency
Investigators: J. Seyed-Yagoobi
Institution: Texas A & M University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

The Radial Jet Reattachment (RJR) nozzle developed at Texas A&M University is a device that produces extremely high transport properties between the nozzle and the reattachment surface, and it also provides a strong recirculation region. The device has many uses in heating or cooling surfaces, listing or blowing away surfaces, drying or wetting surfaces, and providing a region for chemical reactions above or near a surface (flame heating).

The feasibility of using a single RJR nozzle concept for natural gas combustion has been successfully demonstrated at our laboratory. The research results have shown very low Nox and CO generation, a very stable and clean combustion, and effective flame impingement heat transfer with the use of the RJR combustion nozzle. The main objective of this proposed research is to study the interaction among multiple RJR combustion nozzles to determine the optimum design criteria that result in a minimum generation of undesirable combustion product with a maximum heat transfer to the impingement surface. The second objective of the proposed research is to investigate the curvature effect of the impingement surface on the combustion. The existing Combustion Jet Impingement Facility (CJIF) will be utilized for this proposed experimental work. The facility is well instrumented with air and gas flow meters and equipped with the state- of-the-art gas analyzers to determine NO, NO_x, CO, CO_2, and O_2 concentrations in the combustion exhaust gases.

The combustion facility also allows the direct measurements of the heat transfer to the impingement surface, as well as temperature and pressure profiles along the heated impingement surface under various operating conditions.

Many industries use flame heating of surfaces. A conservative assumption of 15% improvement in flame heating efficiency will result in significant savings in energy and natural gas consumption. More importantly, this will be accomplished by reducing the generation of the hazardous combustion products such as NO_x and CO by at least a factor of three and five, respectively, compared to the typical co-axial flame heating technology currently used in industry (these estimations are based on our existing data for a single RJR Combustion nozzle).

Upon completion of the proposed research, the RJR Combustion technology will be ready to be incorporated in appropriate industrial processes where a clean, stable, and efficient flame heating is desirable. For instance, this technology can be used in processes requiring surface heat treating of materials such as glass or metal. Furthermore, this technology can be used to provide high temperature dryer drums for application in the paper industry, replacing a century old technology. Existing steam dryer drums are thermally very inefficient (less than 60 percent) and their operation temperatures are limited to 370°F. Current industry demand is for high temperature dryer drums (higher temperatures allow for higher machine speeds), which provide a uniform temperature distribution along the drum. The RJR Combustion technology shows a definite promise for such an application. It has the potential to provide an environmentally safe, energy efficient, high uniform temperature heating of dryer drums.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

A Process To Convert Industrial Biosludge and Paper Fines to Mixed Alcohol Fuels

EPA Grant Number: R828598C018
Subproject: this is subproject number 018 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: A Process To Convert Industrial Biosludge and Paper Fines to Mixed Alcohol Fuels
Investigators: Mark Holtzapple
Institution:-Texas A & M University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

The proposed research will focus on converting two wastes - industrial biosludge and paper fines - into useful products. Industrial biosludge results when industrial wastewater is biologically treated; the cells that grow on the waste must be purged from the system. Disposal costs typically range from $200 to $750/dry tonne. Paper fines result when paper is recycled; approximately 10 to 15% of the recycled paper must be purged because the fibers are too short for reuse. Disposal costs via landfills are $8 to $180/dry tonne with an average of $50/dry tonne. These two wastes will be blended and converted to mixed alcohol fuels via the MixAlco process, a proprietary technology owned by Texas A&M University and the State of Texas.

The MixAlco process converts biodegradable wastes, such as paper fines and industrial biosludge, into mixed alcohol fuels (e.g., isopropanol, isobutanol, isopentanol). The wastes are first treated with lime to enhance reactivity; then they are converted to volatile fatty acids (VFAs) such as acetic acid, propionic acid, and butyric acid - using a mixed culture of microorganisms derived from cattle rumen or anaerobic waste treatment facilities. The paper fines provide energy and the industrial biosludge provides nutrients for the microorganisms. A neutralizing agent (e.g., lime or calcium carbonate) is added to the fermentor to maintain the pH near neutrality, thus the VFAs become VFA salts (e.g., calcium acetate, propionate, and butyrate). Using proprietary technology, the VFA salts are concentrated and then thermally converted to ketones which are subsequently hydrogenated to alcohols.

Research will be performed on the fermentation portion of the process. The rates and yields of the fermentation step will be determined by growing the mixed culture of VFA-producing microorganisms in a 1-L centrifuge bottle. The cells and unreacted feedstock are easily separated Assuming the mixed alcohol fuels sell for $0.80/gal (a price typical of fuel oxygenates) and the investors obtain a 45% return on investment, the blended wastes can be accepted for a tipping fee of $28/dry tonne, which is substantially less than current disposal costs.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Homogeneous Catalysis in Supercritical Carbon Dioxide

EPA Grant Number: R828598C019
Subproject: this is subproject number 019 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Homogeneous Catalysis in Supercritical Carbon Dioxide
Investigators: Aydin Akgerman
Institution: Texas A & M University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

This project focuses on pollution prevention in chemical process industries by replacing organic solvents used in homogeneous catalysis with environmentally friendly solvents. We propose to evaluate supercritical fluids as the solvent in homogeneous catalysis. Furthermore, supercritical fluids bring desirable advantages when used as the reaction media.

Homogeneous catalysts are normally soluble metal salts or complexes that are dissolved in a suitable organic solvent which is used as the reaction medium. These solvents are coming under close scrutiny because of their toxicity, and there is a motion in industry today to replace these solvents with environmentally benign solvents. Supercritical fluids have properties that could make them nearly the ideal media for conducting homogeneous catalytic processes that involve reactions of gas phase reactants with soluble liquid or solid substrates. Gases are completely miscible with supercritical fluids. Therefore, gas phase reactant concentrations in the supercritical media would typically be much higher than achievable in normal liquids. Furthermore, very large negative partial molar volumes in supercritical systems can be exploited to adjust rate constants of many reactions in order to achieve high selectivities.

In this project we propose to use supercritical carbon dioxide as the reaction medium for homogeneous catalysis. Supercritical carbon dioxide is non-toxic and environmentally acceptable. It is non- flammable, thus its use does not introduce a safety hazard during operation. It has a low critical temperature, 31.3°C and a moderate critical pressure, 73.8 bar (1073 psia); it is cheap and readily available in large quantities.

We propose to concentrate on two classes of reactions commonly performed by homogeneous catalysis employing organic solvents, namely hydroformulation and oligomerization. Hydroformulation is a carbon insertion reaction, very important in building new products, whereas oligomerization reactions are widely used on an industrial scale either to provide high added value chemicals or to upgrade by-product olefinic streams. Both reactions are used extensively in manufacture of high value fine chemicals and/or pharmaceuticals.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

The Binding Chemistry and Leaching Mechanisms of Advanced Solidification/Stabilization Systems for Hazardous Waste Management

EPA Grant Number: R828598C021
Subproject: this is subproject number 021 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: The Binding Chemistry and Leaching Mechanisms of Advanced Solidification/Stabilization Systems for Hazardous Waste Management
Investigators: David L Cocke
Institution: Lamar University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

The GCHSRC sponsored team has made enormous progress in understanding the binding chemistry and leaching mechanisms of priority metal pollutants in cement based solidification/stabilization (S/S) systems.

Concepts and models have been developed and refined on rather simple systems and these are drawing national and international attention. However the complex hazardous waste problems being attacked today are requiring commercial vendors to empirically design more complex S/S schemes to meet growing use of this technology for hazardous waste management of complex waste systems containing organics and inorganics. This proposal requests funding to examine the chemical and physical mechanisms of the additives of the more complex S/S systems to clearly delineate their effects on the binding chemistry and leaching mechanisms and to design improved systems to handle these complex wastes. It can be divided into three main tasks:

(a) To apply our advanced understanding of the chemistry of cementitious and pozzolanic materials to explain the operation of accelerators, inhibitors, and property modification additives,

(b) to apply and exploit binding chemistry concepts, models and mechanisms that will lead the way to the design of improved stabilization/solidification processes for complex wastes, and

(c) to transfer this technology directly to the vendors for commercialization.

The binding chemistry changes induced by controlling the nature of the metal or organic in solution, the nature during adsorption. reactive coating, reactive incorporation, and the nature and charge of the surface will be explored by surface analysis using XPS, ISS, AES, and RBS and bulk techniques using XRD, SEM-EDS, and optical spectroscopies. The advanced models and concepts already developed will be applied to tailor additives, predict changes in the solution chemistry, and develop prescriptions for the optimal stabilization and solidification of the above individual and complex waste forms. The objective to produce the most unleachable products will be tested with standard and accelerated leaching procedures. In addition the material structure as to pore volume, pore area, bulk density, and pore diameter will be probed before and after metal doping and before and after leaching with mercury porosimetry to allow the leaching models to be further refined The results will be correlated with Ortego's results at Lamar University and Cartledge's results from LSU and will be examined by Batchelor from TAMU for incorporation in his leaching models, which can differentiate the chemical and physical influences. This proposal requests funding to proceed to the next stage in S/S research that more closely approaches the actual commercial needs of practicing vendors.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Development of an Air-Stripping and UV/H2O2 Oxidation Integrated Process To Treat a Chloro-Hydrocarbon-Contaminated Ground Water

EPA Grant Number: R828598C022
Subproject: this is subproject number 022 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Development of an Air-Stripping and UV/H2O2 Oxidation Integrated Process To Treat a Chloro-Hydrocarbon-Contaminated Ground Water
Investigators: Ku-Yen Li
Institution: Lamar University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Contamination of ground water by synthetic organic chemicals, especially chloro-hydrocarbons, is a nationwide problem. Chloro-hydrocarbons are heavier than water and are quite persistent to bio/photo-degradations. Current treatment method for contaminated ground water is air stripping followed by thermal destruction of the air stream. However, some of the low- volatile compounds, such as dichloroethyl ether (DCEE), can not be removed cost-effectively by air stripping. DCEE can be destructed effectively by UV/H_2O_2 oxidation as has been reported by this research project. Therefore, the objective of this project was to develop an integrated treatment method of air- stripping and UV/H_2O_2 oxidation to treat the chloro- hydrocarbon contaminated ground water.

This research project has moved one step closer toward a field test: 55 gallons of field-contaminated ground water was collected for experimental use. More than fifty contaminants were identified in this sample. Chemical analysis also indicated very high salinity and hardness. This contaminated ground water was treated by air-stripping followed by UV-peroxidation reaction. Preliminary results indicated the treated ground water contained only non-volatile and non-chloro compounds. Since these organic compounds are non-toxic to the activated sludge, this residual water could be discharged to an aeration lagoon for biodegradation or to a surface water if permitted.

Experimental results from this laboratory and others indicate that UV peroxidation of chlorinated hydrocarbons is controlled by the direct attack of OH free radicals. This free radical attack causes dechlorination followed by oxidation. Therefore it is proposed in this project to enhance the oxidation efficiency by increasing the OH free radical generation rate. The OH free radical generation rate may be increased by increasing the quantum yield of UV photolysis of H_2O_2 or by adding a catalyst such as soluble iron salt or TiO_2.

A cost analysis of this integrated process will be performed to find an optimum conditions for the air-stripping so that a lower treatment cost can be achieved.

The objectives of this project during the next year are:

1) to improve the efficiency of the UV/H_2O_2 reactor by increasing the hydroxyl free radical generation rate, and

2) to find an optimum balance in between the air-stripping and the UV/H_2O_2 treatment processes to achieve a lower treatment cost.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

A Comparative Study of Siting Opposition in Two Counties

EPA Grant Number: R828598C023
Subproject: this is subproject number 023 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: A Comparative Study of Siting Opposition in Two Counties
Investigators: Stuart A. Wright
Institution: Lamar University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

This proposal is a comparative analysis of two contested hazardous waste disposal siting cases in the Gulf Coast region of Texas employing identical treatment methods and technologies (solidification and salt dome disposal). The study is designed to identify the sources of community opposition and the role of non-technical variables correlated with siting failure. By introducing controls over the technical aspects of siting, it becomes possible to measure the effects of the non-technical (social, political, economic) variables. It is not uncommon that technical controversies center largely on non-technical issues (e.g., disputes over the appropriate role of government, individual autonomy vs. community goals, moral or ethical issues). To assume that siting conflicts are strictly matters of engineering and science shows poor sociological insight.

Technology is important, but it may not be the most important consideration in environmental conflicts. A determination of the role of nontechnical factors is enhanced in the proposed research design. Methodologically, findings drawn from single case studies may be muddled by the fact that they lack comparable conditions or parallels. Comparisons with other siting cases involving different technologies or methods of treatment (e.g., incineration), or even different types of waste (e.g., nuclear, conventional), confound the problem and are vulnerable to the "apples and oranges" criticism. The apples and oranges problem is avoided here. Moreover, should the comparison case yield a different outcome, it would be possible to isolate those factors related to public acceptance or siting success from among the residual variables.

The project builds on a feasibility study conducted last year confirming assessments of a potential comparison case: (1) the waste company submitting the permit application has proposed identical treatment and disposal methods as the failed Liberty county case- studied previously; (2) the permit application is near completion; (3) the community opposition group (Concerned Citizens Against Pollution) has declared intentions to fight the new permit; (4) permission for gaining access to key personnel in both the waste company and the local opposition group has been secured; and (5) the waste company has recognized the importance of community involvement and democratic participation in the siting process and expressed a willingness to meet with opposition leaders. Generally, this proposal outlines how a comparative analysis of two contested sites might be conducted in order to better understand how sociological factors influence and shape public responses.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Sonochemical Treatment of Hazardous Organic Compounds II: Process Optimization and Pathway Studies

EPA Grant Number: R828598C024
Subproject: this is subproject number 024 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Sonochemical Treatment of Hazardous Organic Compounds II: Process Optimization and Pathway Studies
Investigators: Thomas Junk, W. James Catallo
Institution: Louisiana State University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

The presence of hazardous waste mixtures in sediments and aquifers of the U.S. presents a major challenge in terms of developing effective and feasible remediation technologies. A treatment system well suited for this task should (a) efficiently remove refractory chemicals under actual field conditions in a reliable and cost-effective fashion, (b) avoid environmentally damaging technologies such as excavation or introduction of harmful chemicals, and (c) allow in-situ treatment of large volumes of soils or sediments without the burden of large scale transportation. Currently, few remediation methods satisfy these criteria.

Previous work by the authors addressed the use of ultrasonification as an environmentally benign, field deployable method that is based on mature, readily available hardware. While this technology has received some attention in the recent past, and pilot scale efforts are underway to apply it to the dechlorination of residues of carbon tetrachloride in soils and ground water, its scope, exact effects on substrates, and limitations are poorly understood. This lack of mechanistic understanding, rather than practical difficulties in its implementation, is a major limiting factor in evaluating its deployment at this time.

The authors have previously demonstrated that sonochemical pollutant degradation is applicable to a much wider range of chemicals than reported in the literature, including chlorinated phenols, organophosphorus pesticides, and complex waste mixtures containing chlorinated paraffins, olefins, and aromatics (Catallo, W. J., and Junk, T. Waste Management, 15(4), 1995).

Three objectives will be targeted in the current study. The first is a deeper mechanistic understanding of the processes which ultimately lead to substrate destruction. Polar organic, nonpolar organic, volatile, and inorganic sonolysis products in aqueous treatment systems will be identified and quantified. Stable isotope exchange/incorporation studies using deuterated and protiated standards will be deployed in order to gain information on sonochemical reaction mechanisms. Second, procedural variations will be evaluated to optimize degradation rates and minimize energy and time requirements for sonolytical treatment methods. For example, factors such as novel cell design, additive ultrasonic sources, and physicochemical manipulation of the treatment system will be examined. Finally, the use of this technology in treating nitrogen-containing organic explosives (e.g., nitrotoluenes, RDX, HMX) pose a considerable contamination problem. Initial, semi-quantitative experiments indicated a high level of substrate degradation for trinitrotoluene, but rates and reactions products are currently unknown. The present work will build on insights and data generated in a previous GCHSRC-funded effort, "Sonochemical Treatment of Hazardous and Chlorinated Hydrocarbons in Aqueous Systems" (1993-94), which demonstrated the sonochemical degradation of a range of polychlorinated organic compounds and provided preliminary mechanistic insights.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Laser Diagnostics of the Combustion Process within a Rotary Kiln Incinerator

EPA Grant Number: R828598C025
Subproject: this is subproject number 025 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Laser Diagnostics of the Combustion Process within a Rotary Kiln Incinerator
Investigators: Timothy J. Garrison
Institution: Louisiana State University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

This research program seeks to improve the scientific foundation of the key processes occurring within a rotary kiln waste incinerator. To date, much of the research on large-scale incinerators has been "black box" in nature; a majority of the existing knowledge on these systems consists of empirical observations developed through species measurements made within the stack gases. To date, very little research has examined the complex physics governing the combustion process internal to a large- scale hazardous waste incinerator. As a result, the current understanding of the incineration process is restricted, making it difficult to develop improvements to the process.

The main intent of the proposed research is to transfer technology used to visualize, measure, and understand the complex processes within military aircraft combustors to study the combustion within a waste incinerator. In particular, the primary objective of the research program is to develop a laser diagnostic system that can be used to study and enhance the combustion within a large-scale rotary kiln incinerator. The laser diagnostic system will be used to study the combustion within a newly established research rotary kiln located at Louisiana State University (LSU). This facility, which is a down-scaled version of a complete incineration system typically used in industry, provides the necessary test bed within which the laser diagnostics can be applied. The ultimate objective of the research program will be the development of methods for controlling the combustion process to optimize waste destruction efficiency and, hence, to decrease costs and emissions. The subject research program will facilitate the development of the instruments needed to accomplish this objective.

The primary thrust of the research program will be to develop both a Planar Laser Induced Fluorescence (PLIF) system and a Planar Laser Scattering (PLS) system that can be used to study the combustion within LSU's rotary kiln incinerator. The PLIF system will be used to qualitatively observe the formation of various combustion products (e.g., NOx and OH) throughout the primary and secondary combustion chambers. This system will be used to develop a direct link between events occurring internal to the incinerator and the measured species levels in the stack gases. Moreover, it will enable determination of the events which lead to elevated emissions and will provide a mechanism for evaluating methods to alleviate such occurrences.

The PLS system will be used to visualize the flow pattern within the primary rotating kiln. Past research has demonstrated that the flow pattern within an incinerator is a critical parameter in achieving efficient waste destruction. It governs the mixing of the fuel (i.e., waste material) and oxidizer, the residence time within the combustion zone, and the temperature distribution, all of which are controlling factors in the incineration process. However, research directed at understanding these mechanism has gone largely unaddressed.

Both the PLIF and PLS instruments are ideally suited for measurements within the rotary kiln incinerator. The primary advantage is that both methods are non-intrusive, enabling data to be collected despite the harsh operating environment within the kiln. Additionally, both methods provide field data over large portions of the combustion chamber in a single set of experiments. Once these instruments have been adapted to work within the waste incinerator, the data and knowledge they provide will be used to develop and assess methods for enhancing the efficiency of waste incinerators.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Use of Inorganic Ion Exchangers for Hazardous Waste Remediation

EPA Grant Number: R828598C026
Subproject: this is subproject number 026 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Use of Inorganic Ion Exchangers for Hazardous Waste Remediation
Investigators: Abraham Clearfield, A. I. Bortun
Institution: Texas A & M University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Organic ion exchange resins find extensive use for the removal of toxic heavy metals such as lead, mercury, and chromium from a variety of industrial processes. They are finding increasing use for waste minimization and management. However, the commercially available resins are only partially effective or unusable in many situations, and new materials are required. We have chosen to examine three such situations (i) the removal of trace or low levels of cations from hot organic solvents, (ii) separation and recovery of Cr^{3+} from tannery waste, and (iii) recovery of precious metals from hostile environments such as nuclear waste streams. There exists a large array of inorganic compounds which possess ion exchange properties. We will utilize natural and synthetic micas, layered titanium and zirconium phosphates, both as gels and crystals, compounds with tunnel structures of the pharmocosiderite type and redox exchangers to accomplish our objectives.

Organic resins are not stable in organic solvents at elevated temperatures. Thus, many solvents must be cooled and diluted with water in order to remove ions such as Cu^{2+}, Ni^{2+}, and Cr^{3+}. These ions need to be removed in order to reuse the solvents and minimize waste disposal of these toxic solutions. The inorganic exchangers chosen are stable in hot organics, have high exchange capacities, and can be used without cooling or diluting the solvents. Tests will be run on solutions of benzyl alcohol and toluene to determine the most suitable inorganic exchangers, and then column experiments will be carried out with simulated industrial solutions of the metallic ions. Each year thousands of tons of valuable chromium hydroxide are discarded because the currently available organic resins are not selective enough to separate Cr^{3+} from Al^{3+}, Fe^{3+} in the tanning solutions. Highly selective inorganic exchangers will be chosen and separations carried out on simulated tannery solutions.

Hundreds of millions of dollars of precious metals are often present in hostile environments (nuclear wastes) and in very dilute solutions. Their recovery will be facilitated by use of redox inorganic exchangers that exchange Pd^{2+}, Rh^{2+}, Ru^{2+} onto their surface and reduce them spontaneously to metal. All other ions are washed off, and then the metals are reoxidized and washed off the exchanger in pure form and recovered.

Our broader long range objective is to show that inorganic ion exchangers can solve a variety of waste management problems and work with an industrial partner (currently Allied Signal Corp.) to help commercialize the exchangers.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Kaolinite Sorbent for the Removal of Heavy Metals from Incinerated Lubricating Oils

EPA Grant Number: R828598C027
Subproject: this is subproject number 027 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Kaolinite Sorbent for the Removal of Heavy Metals from Incinerated Lubricating Oils
Investigators: Matthew J. Hall
Institution: University of Texas
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

In this experimental research the use of sorbents is being investigated as a means of removing airborne lead and barium from the effluent stream of a liquid waste incinerator. For the case being investigated, the metals enter the gas phase as a result of the incineration of waste lubricating oils containing these metals.

Questions concerning emissions of heavy metals are among the most important associated with incineration of municipal and industrial waste. While the human health risk of incinerator emissions appears to be small, metal emissions have been the dominant component of the risk levels identified thus far. Many of the metals found in incinerator effluents are known to be hazardous to humans at high enough levels of exposure, causing either long-term illness or more immediate acute symptoms. Among those of concern are arsenic, barium, beryllium, chromium, cadmium, lead, mercury, nickel, and zinc. Lead and barium will be the focus of this study since these are two of the most prominent metals found in waste lubricating oils. Human exposure to lead can cause serious illnesses, including damage to the nervous system and kidneys. Barium and barium compounds can be skin and eye irritants; long-term effects of exposure are undetermined.

The objective of the research is to study the use of inorganic sorbents to adsorb heavy metal emissions from incinerated metal containing waste such as waste lubricating oils. Alumino-silicate sorbents such as kaolinite and alumina are being examined. In an application, the artificially introduced sorbents could be removed from the effluent stream of a waste incinerator using conventional baghouse collection techniques. Kaolinite has been found to bind chemically to airborne lead emissions. Because of the strong chemical bond between the lead and the kaolinite, it is considered nonleachable. Kaolinite is an inexpensive, naturally occurring clay and is an excellent material for cement manufacture. In certain types of construction, cement made from the spent metal containing sorbents may be acceptable, providing a convenient means of disposal.

A 13 kW turbulent flow reactor is used to achieve the temperature and residence times typical of a waste incinerator. An organometallic, lead (II) ethylhexanoate or barium naphthenate, mixed with heptane was burned with air yielding between 15 and 3000 ppmv of the metal in the gases. Sorbent (kaolinite or hydrated lime) was introduced upstream of the reaction zone. Samples of lead or barium collected without sorbent injection showed the metals' particle size distributions in the submicron range.

A computer code, MAEROS2, was adapted to predict lead oxide particle size distribution for similar combustor conditions and was compared with experimental results. The sorbents were effective in scavenging lead. With kaolinite sorbent, lead concentrations were inversely proportional to particle diameter. Even with sorbent, the barium was found predominantly in the submicron size range - suggesting little adsorption.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Destruction of Chlorinated Hydrocarbons in Process Streams Using Catalytic Steam Reforming

EPA Grant Number: R828598C028
Subproject: this is subproject number 028 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Destruction of Chlorinated Hydrocarbons in Process Streams Using Catalytic Steam Reforming
Investigators: James T. Richardson
Institution: University of Houston , University of Texas at Houston
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

There are about 15,000 chlorinated compounds in commercial use, including pesticides, pharmaceuticals, disinfectants, and consumer products such as plastics. In addition, chlorine intermediates are used in reactions leading to nonchlorinated products, such as silicon for electronic chips or epoxy resins. About 85% of pharmaceuticals require chlorine at some stage of their manufacture. Technology not only needs to eliminate toxic emissions from these industries but also to destroy the vast quantities of chlorinated solvents, chloroaromatics, and PCBs contaminating dump sites, soils, and water supplies. A novel method is catalytic destruction of chlorocarbons with steam which is cleaner and more cost effective than incineration with air. Research at the University of Houston demonstrated the viability of this approach to detoxify chlorocarbons such as solvents, substituted aromatics, and PCBs.

Fundamental research has resulted in rate equations, surface mechanisms, catalyst activity patterns, and deactivation trends. Long-term tests have shown 5-nines destruction at temperatures from 500 to 800°C and gas hourly space velocities from 10,000 to 200,000 hr^{-1}, without formation of harmful intermediate products but with production of HCl, CH_4, CO, and

H_2, and projections indicate even high levels possible. The technology is poised for commercialization, but first we must design and test suitable large scale reactors that operate at high efficiency without parallel thermal reactions. We have selected three novel designs in which the catalyst bed is heated internally in order to enhance the catalytic path. The first of these, a ceramic foam heated by infrared lamps, is now being tested in long-term runs designed to develop scale-up data and operating experience.

At the same time, we are collaborating with a local company to design a prototype unit suitable for on-site testing in a process to remove chlorinated hydrocarbons from landfill gas. This project will test the other reactor designs to provide a sound rationale for selecting the best in terms of efficiency of destruction, long-term stability, operability, maintenance, safety, and cost. These designs are a conventional bed of catalysts heated with a radio frequency induction coil and a ceramic-coated metal monolith heated by electric current.

This phase of the project will cost about $65,000 and take one year to complete. This technology will be applicable not only to landfill gas facilities but also to other processes such as PVC production and semiconductor manufacturing in which process streams must be cleaned of chlorinated hydrocarbons in order to reduce emissions. Since the process units are compact and constructed in modules, they will be also suitable for clean-up of existing sites.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Integrated Process Treatment Train (Bioremediation {Aerobic/Anaerobic} and Immobilization) for Texas Soils Contaminated with Combined Hazardous Wastes

EPA Grant Number: R828598C029
Subproject: this is subproject number 029 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Integrated Process Treatment Train (Bioremediation {Aerobic/Anaerobic} and Immobilization) for Texas Soils Contaminated with Combined Hazardous Wastes
Investigators: C. Vipulanandan, Dennis Clifford, D. J. Roberts
Institution: University of Houston , University of Texas at Houston
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

The complexity of contaminated soils requiring treatment and the imposition of strict regulatory requirements for the allowable types and levels of contaminants present in soils often precludes the use of only one treatment technique to decontaminate the soils. The solution will often require the use of several treatment processes in a "treatment train". In this study, a cost-effective treatment train to treat Texas soils that are highly contaminated with organic compounds and heavy metals is being developed. Several soil and treatment parameters affecting the development of the treatment train have been investigated.

Both synthetically contaminated soils (control soils) and field soils have been used in this study. The composition of the control soil sample was 20% clay (kaolinite or bentonite) and 80% sand. New studies have incorporated up to 4% soil humus into the control soil. The control soils were contaminated with various amounts of phenol, kerosene, lead, or chromium and then used for parametric studies.

Field samples were collected from a trolley car maintenance site and two lead battery recycling sites in Houston, Texas. Ordinary Portland cement and a phosphate solution were used in solidifying and stabilizing Pb-contaminated soils. Adsorption-desorption isotherms for clay with phenol, lead, naphthalene, and Cr(VI) have been developed.

A culture developed during this research (UH-I) degraded up to 1800 mg/L phenol within eight days (the highest concentration reported in the literature). Up to 30 mg/L of Pb did not affect the degradation of 1000 mgl of phenol by UH-I. The culture effectively degraded the phenol from a soil contaminated with 10,000 mg/kg phenol in three days, in a continuously stirred batch reactor, at a loading of 50 g/l of contaminated soil. Successful solidification/stabilization (S/S) with cement binder was only accomplished after the phenol concentration in the soil was reduced to 400 mg/kg. A field soil contaminated with up to 800 mg total extractable hydrocarbons/kg soil and 450-750 mg Pb/kg soil was effectively treated by initial biodegradation of the organic compounds and then solidification of the residues and remaining soil using cement. Field soils contaminated up to 10,000 mg/kg of Pb were effectively solidified/stabilized with cement binder.

Successful phosphate stabilization experiments were performed on lead battery recycling site soils containing up to 80,000 mg Pb/kg soil. The simple addition of soluble phosphate and chloride salts led to the formation of chloropyromorphite, $Pb_5(PO_4)_3Cl$, an extremely insoluble form of lead, which easily passed the TCLP test. More work is proposed for the next year on the procedures for in-situ phosphate stabilization and its long term viability.

For the next year of study, we will continue to study the effect of soil humus in the soil on the treatment methods. The effect of additional contaminants such as a polynuclear aromatic hydrocarbon (PAH), kerosene, and chromium (Cr) on the treatment techniques will also be investigated. Research concerning the chemical stabilization of Pb-contaminated soil with phosphate/chloride solutions will focus on the stability of the complex under natural conditions and under accelerated biological growth. Developing the process treatment train will focus on the optimization of operating conditions for the treatment processes.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Photo-Oxidation by H_2O_2/VisUV of Off-Gas Atmospheric Emissions from Industrial and Environmental Remediation Sources

EPA Grant Number: R828598C030
Subproject: this is subproject number 030 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Photo-Oxidation by H_2O_2/VisUV of Off-Gas Atmospheric Emissions from Industrial and Environmental Remediation Sources
Investigators: H. W. Prengle, James M. Symons
Institution: University of Houston , University of Texas at Houston
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Gaseous emissions originate from a number of sources: manufacturing and production operations, waste water treatment, contaminated ground water, soil remediation, and other commercial operations. This research is an extension of the H_2O_2/VisUV process for waterborne hazardous substances.

In 1995, work was completed on photo-oxidation of benzene (BNZ), trichloroethylene (TCE), trichloroethane (TCA), methanol (MTH), isohexane (IHX), nitromethane (NMH), and certain mixtures. The close-out funding will permit experiments on four to five additional compounds taken from the following list: acetonitrile, acrylonitrile, acetamide, methyl sulfide, carbonyl sulfide, and carbon disulfide. These, plus other compound results will permit extension to 50-100 other compounds on the hazardous substance list.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Concentrated Halide Extraction and Recovery of Lead from Soil

EPA Grant Number: R828598C031
Subproject: this is subproject number 031 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Concentrated Halide Extraction and Recovery of Lead from Soil
Investigators: Dennis Clifford
Institution: University of Houston , University of Texas at Houston
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Hundreds of lead battery recycling sites (LBRSs) are in need of cleanup in the United States. Typically, these sites cover several acres and have average lead concentrations in the range of 50,000 to 100,000 mg Pb/kg soil in the top 1-2 feet of soil. With funds from GCHSRC and the Texas Advanced Technology Program, the Principal Investigator and his research group at the University of Houston have developed several methods of removing and recovering the lead from LBRS soils. These include inert atmosphere heating to 900°C and ambient-temperature extraction with metallic sodium in anhydrous ammonia. Although these methods could remove more than 96% of the lead (and other toxic metals) from the soil, they proved to be too complex to scale up economically. Furthermore, high temperature heating rendered the residual lead more extractable by the TCLP test. Remediating LBRS soils is particularly challenging because the latest target residual lead concentrations for treated soil returned to a site are 500 and 1000 mg Pb/kg soil for residential and non-residential areas, respectively. Thus, for an average soil concentration of 75,000 mg Pb/kg soil, 99 to 99.3% lead removal is required.

Five years of research experience with LBRS soils at UH led to the discovery of the chloride extraction process which, in the initial tests with 4.3 M NaCl, could extract more than 97% of the lead from a soil, containing 78,000 mg Pb/kg soil. This proposal has recently been selected for funding by the Superfund Innovative Technology Evaluation-Emerging Technology (SITE-ET) Program. The SITE-ET is focused on scale-up and on-site operation of the process.

Numerous encouraging test results have been obtained during the first five months of GCHSRC funding. The highlights are as follows: (1) a 19-point statistically-random composite sample was obtained from the Houston Lead Company (HLC) property and completely characterized prior to its use in the bench-scale extraction tests. It contained 76,700 mg Pb/kg soil present mostly as $PbSO_4$, (2) calcium, magnesium, potassium, ammonium, and lithium chlorides were not nearly as effective as sodium chloride for extracting lead, (3) two-stage sequential batch extractions with a mixture of 4.3 M NaCl and 0.29 M HCl achieved >98% lead removal and residual lead levels approaching 1000 mg Pb/kg soil, (4) the optimum solution-to-soil ratio for 4.3 M NaCl extraction of the HLC soil was 6.7 to 1, (5) sodium chloride solution recycled after precipitation of $Pb(OH)_2$ was nearly as effective as fresh NaCl solution for extracting lead, and (6) hot (100? C) 6.12 M NaBr extraction of the HLC soil achieved 99.2% lead removal in a single batch extraction. Continued GCHSRC involvement will support the completion of the scheduled bench-scale tests with chloride salts and additional tests with bromide salts which, although more expensive, have proven to be more than ten times as effective as chloride for extracting lead.

The objectives of the second year of research are to (a) support the SITE-ET pilot-scale field study with additional bench-scale data on chloride extraction procedures, (2) complete the NaCl+HCl extraction studies of predominantly $PbCO_3$ soil from the Lead Products Company (LPC) site, (3) study the extraction of the HLC and LPC soils with NaBr at ambient and elevated temperatures, (4) test the optimized halide extraction process using 100-g samples in a bench-scale two-step counter flow batch extractor, and (5) screen the ability of the halide extraction process to extract other toxic metals, e.g., Cd, Cu, Zn, and Ni from representative hazardous waste site soils.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Biodegradable Surfactant for Underground Chlorinated Solvent Remediation

EPA Grant Number: R828598C032
Subproject: this is subproject number 032 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Biodegradable Surfactant for Underground Chlorinated Solvent Remediation
Investigators: Kishore K. Mohanty, Raj Rajagopalan
Institution: University of Houston , University of Texas at Houston
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

The objective of this proposal is to identify a cost-effective, biodegradable surfactant for removal of toxic chlorinated solvents from aquifers using surfactant-enhanced flushing. The solubilization and mobilization of the DNAPL phase will be addressed in combination with ex-situ separation of the dissolved organics by micellar-enhanced ultrafiltration, a new separation technique that takes advantage of the self-associating property of the surfactants. Chlorinated hydrocarbons are common aquifer pollutants because of their use as solvents and degreasers. Although the solubility of these hydrocarbons in water is low, their concentrations do exceed the drinking water standard by several orders of magnitude. Remediation of the soil contaminated with these DNAPLs using conventional pump-and-treat methods can require thousands of pore volumes of water because of their low aqueous solubility. An EPA-sponsored workshop has analyzed all the remediation techniques for DNAPL-contaminated aquifers and has identified surfactant-enhanced flushing as a promising technology.

Surfactant-enhanced flushing can significantly decrease the pore volume requirement by increasing the aqueous solubility of these contaminants. The issues important for this technique to succeed in the field are (i) biodegradability and cost effectiveness of the surfactants, (ii) surfactant loss due to adsorption, (iii) vertical migration of residual DNAPL due to low interfacial tension, (iv) ease of separation of organics from water above ground before re-injection of water. The objective of this proposal is to address some of these issues and to identify a cost-effective, biodegradable surfactant that can be used in this treatment. A three-step approach will be taken: (i) In the first step, we shall perform a systematic analysis of the surfactant-enhanced solubilization of the chlorinated solvents, (ii) the second will focus on an evaluation of the mobilization of initially trapped DNAPL within soils due to surfactants, (iii) in the final segment we shall investigate the micellar-enhanced ultrafiltration of the produced water. By taking a comprehensive view of both the in-situ and ex-situ aspects of chlorinated solvent remediation, we aim to develop a process that will succeed at the field scale.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

A Software Guidance System for Choosing Analytical Subsurface Fate and Transport Models Including a Library of Computer Solutions for the Analytical Models

EPA Grant Number: R828598C033
Subproject: this is subproject number 033 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: A Software Guidance System for Choosing Analytical Subsurface Fate and Transport Models Including a Library of Computer Solutions for the Analytical Models
Investigators: Theodore G. Cleveland, William G. Rixey, Anthony N. Williams
Institution: University of Houston , University of Texas at Houston
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Contaminant fate and transport models are used for predicting the exposure component in risk assessment, evaluating contaminant management strategies, and designing contaminant recovery systems. The models range from complex numerical simulators to relatively simple analytical expressions. Although the analytical solutions are limited in scope when compared to numerical simulators, they are useful in providing rapid initial estimates in corrective action scenarios, in providing insight into the underlying physicochemical processes, and in investigating the sensitivity of various transport parameters.

A large number of analytical solutions for nonequilibrium transport exist that represent a valuable resource for calculations, but three main problems are faced by the practicing professional who needs to make these calculations. The user must: (1) choose a model framework, (2) search the literature for an analytical expression that satisfies the framework and verifies that the solution is correct, and (3) evaluate the solution involving unfamiliar functions. This effort is multiplied in the case of a numerical simulator, with the added frustration that the numerical simulators require much expertise to use.

The objective of this two-year project is to create a software library of analytical fate and transport models with a selection algorithm to guide the user to the most appropriate model for a particular case. The software will be tested by industrial, government, and academic users for trial and comment. The system will be unique in that it will operate stand-alone or in concert with a general purpose spreadsheet program (e.g., Lotus 1-2-3, Microsoft Excel, Borland Quatro, etc.) to produce solutions to the analytical expressions. A prototype will be completed in early 1996 and will represent a single compendium of simplified analytical expressions with a selection framework for choosing a model that includes tested, documented, and worked solutions that can be easily implemented by practicing environmental professionals.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Measurement of Oxygen Transfer Rate in Soil Matrices

EPA Grant Number: R828598C035
Subproject: this is subproject number 035 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Measurement of Oxygen Transfer Rate in Soil Matrices
Investigators: Ku-Yen Li
Institution: Lamar University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Biological processes have been used to remediate hydrocarbon- contaminated soil because they are cost effective and compatible with the environment. For on-site soil bioremediation, a rate-controlling model to quantify the operation was developed by the principal investigator of this proposal.

The transfer rate of oxygen in a soil matrix can be improved by tilling and/or composting the soil matrix. Currently, questions remain regarding when soil is sufficiently tilled or composted. The reason is a quantitative method to measure the oxygen transfer rate in a living (with biological activity) soil matrix is not available. This method needs to be developed in order to improve the operation of an on-site soil bioremediation.

A unique method to measure the oxygen transfer rate and oxygen transfer coefficient in non-living (with no biological activities) soil matrices has been developed in the first year of this research proposal. The equipment used was a modified computer- controlled respirometer system (N-CON system, Model 00-210). Results indicated oxygen transfer coefficient in soil matrix decreases as the degree of water saturation (defined as water porosity/total porosity) increases. This may be due to the fact that increased water content may reduce the gas-liquid interfacial area in a soil matrix.

Soil water serves two different functions in soil bioremediation. It serves as a growth medium for microorganisms, while it blocks the oxygen transfer through soil air pores. There exists an optimum water content in soil that ensures a maximal bioremediation rate. When soil water exceeds this optimal water content, bioremediation rate may be limited by oxygen-transfer rate. On the other hand, when insufficient water is present in soil, the bioremediation rate may be limited by biological reaction.

The measurement of oxygen transfer in a living soil (with biological activity) is the primary goal of this project. A living soil matrix will be incubated in a reactor with supplies of substrate, inorganic nutrients, and oxygen. After incubation, the living soil will be used in the respirometer system for testing oxygen transfer. Several soil compositing materials will be tested by this new measuring method to examine their effects on the oxygen transfer rates in living soil matrices. The specific objectives of this project are:

1. to measure oxygen transfer coefficients in living soil matrices,

2. to determine an optimum water content for bioremediation process in a soil matrix, and

3. to test the effects of soil compositing material on the oxygen transfer in living soil matrices.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Sorbent Technology for Multipollutant Control During Fluidized Bed Incineration

EPA Grant Number: R828598C036
Subproject: this is subproject number 036 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Sorbent Technology for Multipollutant Control During Fluidized Bed Incineration
Investigators: Thomas C. Ho
Institution: Lamar University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

The purpose of the proposed research is to investigate the potential of employing sorbent technology for multipollutant control, including SOx, NOx, HCl, and metals during fluidized bed incineration. Experiments will be carried out in a well- instrumented 76 mm ID fluidized bed incineration system available in the laboratory of the principal investigator. Artificially prepared combustible test materials containing various amount of sulfur, nitrogen, chlorine, and metals will be co-burned in the fluidized bed with various sorbents, including calcined-limestone, hydrated lime, urea-hydrated lime, bauxite, zeolite, and mixtures under different combustion conditions. The objectives of the project are to characterize the multipollutant control process and to identify effective sorbents. The following progress has been made during the performance period from June 1, 1995, through June 30, 1995:

1. Literature Survey - Pertinent literature related to the project has been thoroughly surveyed and efforts have been devoted to collect them.

2. Experimental Set-up - A fluidized bed incineration system has been re-conditioned for the proposed experiments.

3. Personnel Training - Students have been recruited and are currently being trained to operate the fluidized bed system and the Perkin Elmer Model 2100 Atomic Absorption

Spectrophotometer for carrying out the experiments.

4. Sorbents Preparation - Three potential sorbents, i.e., bauxite, zeolite, and limestone have been ordered, prepared, and characterized.

5. Conference Presentation - A paper reporting our current metal capture study was presented at the 4th International Congress on Toxic Combustion By-Products held at UC Berkeley, June 5-7, 1995.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Pollution Prevention by Process Modification Using On-Line Optimization

EPA Grant Number: R828598C037
Subproject: this is subproject number 037 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Pollution Prevention by Process Modification Using On-Line Optimization
Investigators: Ralph W. Pike
Institution: Louisiana State University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

The objective of the research is to use process modification and on-line optimization to reduce discharge of hazardous materials from chemical and refinery processes. This research will be conducted at three chemical plants and a petroleum refinery that have large waste discharges. These are the alkylation process at Star Enterprise's Port Arthur refinery, the acrylonitrile process at Cytec Industry's Westwego plant, and the wet process phosphoric acid and sulfuric acid processes at the IMC Agrico Company's Uncle Sam, Louisiana plant.

The research is in collaboration with Professors Hopper and Yaws at Lamar University where they have developed process modification methodology for pollution prevention. We have developed on-line optimization methodology for source reduction. The objective is to combine these two important methods for pollution prevention and have them share process information to efficiently accomplish both tasks. Professors Hopper and Yaws have demonstrated a potential savings of $10.5 million in fuel costs along with significant reductions in emissions in a study of a generic acrylonitrile plant. Also, Cytec Industries has reported three projects with one having a 98% reduction in air toxics emissions. Emissions from this process rank it first in total releases in the EPA 1992 Toxic Release Inventory (TRI). Also, we have recently completed a study of the on-line optimization of the contact sulfuric acid process at the IMC Agrico plant and demonstrated a 25% reduction in sulfur dioxide emissions along with a 17% improvement in profit. For the other two processes, alkylation and phosphoric acid, we will be initiating process modification and on-line optimization research on them. The alkylation process is the source of sulfuric acid as a spent catalyst which is the TRI chemical with the largest off-site transfer in 1992, and we will be evaluating a new solid catalyst to replace sulfuric acid. The phosphoric acid process ranks fifth in the list of top 50 TRI facilities with the largest total releases, and the process modification research will focus on recycle streams, crystal growth kinetics and temperature and concentration ranges to reduce waste discharges.

Process modification research requires that an accurate process model be used to predict the performance of the plant and evaluate changes proposed to modify the plant to reduce waste discharges. The process model requires precise plant data to validate that the model accurately describes the performance of the plant. This precise data is obtained from the gross error detection system of the plant. In addition, the economic model from the process optimization step is used to determine the rate of return for the proposed process modifications. Consequently, the Lamar and LSU groups have developed a synergism from the two methods for pollution prevention and have selected important processes for their application. Moreover, cooperation of companies has been obtained to apply these methods to actual processes rather than to simulated generic plants.

The research will be the subject of graduate student thesis research, and publications will be aimed at getting the results to practicing engineers. We anticipate the research to be completed in two years.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Pollution Prevention by Process Modification

EPA Grant Number: R828598C038
Subproject: this is subproject number 038 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Pollution Prevention by Process Modification
Investigators: Jack R Hopper, Carl L. Yaws
Institution: Lamar University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Research by Hopper and Yaws and more recently in collaboration with Pike at LSU have been performed to develop examples of pollution prevention by process modifications. These examples can be used as guidelines by process and environmental engineers in developing strategies for pollution prevention.

Pollution prevention by process modification was investigated initially for the production of allyl chloride. The second process investigated was for the production of acrylonitrile. Acrylonitrile is one of the largest volume chemicals produced in the US. It is used in acrylic fibers, copolymers, nitrile rubber, and many other applications. An additional process - vinyl chloride is currently being completed.

The development of these case studies includes analysis of the heart of the process, the reaction system, followed by analysis of the separations processes and the energy utilization in these processes using pinch technology.

In the current research the alkylation of mixed olefins with isobutane is being studied. Rate equations for twenty reactions in the alkylation of a mixture of propene, butene, and amylene with isobutane using sulfuric acid catalyst based on a carbonium ion mechanism was incorporated in the simulation of a Stratco chemical reactor to predict the alkylate product distribution and catalyst degradation as a function of temperature, olefin space velocity, isobutane to olefin ratio, and catalyst concentration. Experimental data to validate the reactor model will be obtained from data sampled from the digital control system of the refinery and validated using gross error detection and data reconciliation methods. The reactor is the key part of the refinery alkylation process, and the reactor simulation is the primary element in on- line optimization of the process where plant-model matching is maintained by updating the parameters in the simulation with data from the distributed control system. Details of the development and verification of the reactor simulation and session will be investigated along with the energy reduction and waste reduction benefits derived from the work.

Hydrocarbon sulfuric acid alkylation is one of the most important refinery processes for producing gasoline blending components for reformulated gasoline: however, spent sulfuric acid catalyst is a large volume Toxic Release Inventory chemical in off-site transfer for recycling. The production of reformulated gasolines as specified in the 1990 US Clean Air Act Amendments will make alkylate an even more important major gasoline blending component in the future.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Water Solubility and Henry's Law Constant

EPA Grant Number: R828598C039
Subproject: this is subproject number 039 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Water Solubility and Henry's Law Constant
Investigators: Carl L. Yaws
Institution: Lamar University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

This project involves a continuation of research by Yaws and co- workers to provide property data helpful in environmental engineering.

Oxygenated chemicals comprise a significant portion of the most hazardous chemicals reported on the EPA's toxic release inventory. In fact, oxygenated chemicals are contained in the top 17 of the most hazardous chemicals in the EPA's 33-50 program. Property data for these and additional oxygenated chemicals are needed for environmental engineering.

Unfortunately, data for solubility of oxygenated chemicals in water are very limited and not available for many compounds. Results for Henry's law constant (i.e., air-water distribution coefficient) are also lacking for many oxygenated chemicals in water. Additional data and results are needed. The objective of this continuing research is to provide additional data and results for water solubility and Henry's law constant for oxygenated chemicals.

In earlier reports, results for water solubility and Henry's law constant were provided for hydrocarbons (paraffins, naphthenes, and aromatics). In this report, results to-date for chlorinated chemicals are presented. Representative solubility values (parts per million by weight) are 7,500 for chloroform ($CHCl_3$) and 0.0047 for hexachlorobenzene (C_6Cl_6).

These results provided by Yaws and co-workers are being favorably received in environmental engineering. One commercial unit, using water solubility data reported by Yaws and co-workers, was designed, fabricated and installed by Texaco. The unit is currently operating and effectively removing organic compounds to provide a clean wastewater stream.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Transferring Technical Information on Hazardous Substance Research by Publishing on the World Wide Web

EPA Grant Number: R828598C040
Subproject: this is subproject number 040 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Transferring Technical Information on Hazardous Substance Research by Publishing on the World Wide Web
Investigators: Donald L. Jordan
Institution: Lamar University
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

Disposal of the ever-increasing amounts of hazardous substances is a critical concern in our society. Vast amounts of resources are necessary to conduct research into the most efficient and effective means to treat these wastes. Officials of the Federal and State Governments and in Industry are involved in the planning, allocating of financial resources, and exchanging technical information to combat this problem. An important element in this process is the rapid transfer and exchange of information on new technology, existing and proposed research efforts, and scientific conference information exchange. The people who most need this technology are usually well-educated scientists, engineers, teachers, and managers. They normally have direct access to the Internet at their office or via modem connection from their homes. Easy access to the technical information concerning hazardous waste materials and the rapid transfer of that information is important to them.

The personnel of the Gulf Coast Hazardous Substance Research Center (GCHSRC) are concerned with coordinating research activities between participating universities, Federal and State Government Officials, industry researchers and a variety of other personnel in this effort. In this capacity, they are involved in (1) planning and conducting an annual symposium at

Lamar University, (2) the contact and notification of more than 30,000 individuals and companies interested in disposal of hazardous substances, (3) the publication and distribution of a hazardous waste journal to interested scientific and industry leaders, and (4) responding to queries concerning the status of ongoing research efforts and the projects. They must also provide access to the associated research data, publish the techniques and procedures used in the research and make available to the public decisions that accrue as a result of their funded research efforts. Additionally, it is important that the GCHSRC facilitate the exchange of technical information they generate from completed research among laboratories and other facilities.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Stress Protein Responses to Multiple Metal Exposure in Grass Shrimp

EPA Grant Number: R828598C041
Subproject: this is subproject number 041 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Stress Protein Responses to Multiple Metal Exposure in Grass Shrimp
Investigators: Cynthia L. Howard, Richard Dobbs
Institution: Mississippi State University , University of Houston
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

The pollution of industrialized coastal areas from mixtures of heavy metal compounds, and the associated impacts on estuarine fish and invertebrate populations, are of increasing concern to toxicologists, industries, and regulators. The toxicities of heavy metal mixtures are strongly affected by variations in the types and concentrations of metals involved, as well as by fluctuations in the prevailing environmental conditions. Little is presently known about the sublethal, multiple toxicities of heavy metal mixtures on natural estuarine populations and communities.

The objective of this research is to investigate the effects of combinations of three heavy metals, expanded this year to include different salinity-temperature combinations on three biomarkers of adaptation of sublethal toxic response in the grass shrimp (*Palaemonetes pugio*), an abundant and important estuarine food chain organism. Laboratory bioassays will be continued using the chloride salts of mercury, cadmium, and copper in combinations of two sublethal concentrations at four different salinity-temperature combinations (total of 32 metal-salinity-temperature exposure groups, plus controls).

The following biomarkers will continue to be evaluated: (1) induction of heavy metal-specific stress proteins, using polyacrylamide gel electrophoresis; (2) accumulation of metal-binding proteins and metallothionein, using gel filtration chromatography; and (3) selective bioaccumulation of the test metals, using cold vapor atomic absorption spectrophotometry and ICP spectroscopy.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Life-Cycle Environmental Costing for Managing Pollution Prevention in the Chemical and Petroleum Refining Industries: A Cross-Border Approach

EPA Grant Number: R828598C042
Subproject: this is subproject number 042 , established and managed by the Center Director under grant R828598 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: Gulf Coast HSRC (Lamar)
Center Director: T.C. Ho
Title: Life-Cycle Environmental Costing for Managing Pollution Prevention in the Chemical and Petroleum Refining Industries: A Cross-Border Approach
Investigators: Beth Beloff, Miriam Heller, David Shields
Institution: University of Texas at Houston
EPA Project Officer: S. Bala Krishnan
Project Period: September 1, 2000 through August 31, 2004
Research Category:

Description:

The chemical and refining industries generate more than half of the total pollution generated by American companies. Thus, a better understanding of the cradle-to-grave costs in these businesses may facilitate technological innovation decisions and operating decisions that transform them into businesses that are sustainable far into the future. In addition, improvements in pollution prevention techniques that result from the findings of this study promise to provide significant environmental benefits for the Gulf of Mexico region.

Approach:

The first step toward building a foundation for a system to account for environmental costs is Cooperative Benchmarking. This concept was created to bring participating (partners) companies together in the same forum to discuss environmental issues/problem areas and generate new ideas for improving environmental management. Seven companies identified by the Business Council for Sustainable Development, Gulf of Mexico, will be participating in this study. Three will come from Mexico and four from the U.S. This proposal is an extension of a project previously funded by Gulf Coast. Hazardous Substance Research Center (Grant #103UHH0345) and is intended to result in a greater understanding of the life-cycle environmental costs associated with chemical, manufacturing, and petroleum refining in the United States and Mexico. NAFTA outlined a series of new agreements on environmental regulation. The scope and comprehensiveness of these pose a serious challenge for companies both in Mexico and the United States. The Institute for Corporate Environmental Management (ICEM) at the University of Houston together with the Monterrey Technological Institute, Mexico, and Pilko & Associates have formed a team to develop an environmental cost accounting approach through a cooperative benchmarking study with the Business Council for Sustainable Development, Gulf of Mexico. This represents the first major collaboration between the University of Houston and the Monterrey Technological Institute, Mexico.

Rationale:

An important aspect in accounting for environmental costs is life-cycle costing. Costs that take place outside the auspices of the manufacturing or refinery are often difficult to identify or quantify. Yet knowledge of life-cycle environmental costs of operating in the chemical and refining industries enable management to attack the problem of pollution prevention directly. The likely result will be world class performance: improved processes and products which drive down total costs while also eliminating waste. The result will also be reduced environmental impact of both product and by-products throughout their entire life cycles.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Hazardous Substance Research Center/South and Southwest

EPA Grant Number: R828773
Center: HSRC (2001) - South and Southwest HSRC
Center Director: Danny D. Reible
Title: Hazardous Substance Research Center/South and Southwest
Investigators: Danny Reible
Institution: Georgia Institute of Technology, Rice University
EPA Project Officer: Mitch Lasat
Project Period: June 1, 2001 through September 30, 2006
Project Amount: $5,550,000
Research Category: Hazardous Substance Research Centers

Approach:

The Center will consist of Louisiana State University, as lead institution, Georgia Institute of Technology, Rice University, and Texas A&M University. The core institutions will be assisted in these endeavors by personnel from Southern University and Howard University. In addition, in recognition of the importance of a local perspective in successful community outreach efforts, we have established partnering agreements with a wide variety of universities and organizations throughout the south and southwest regions. The broad range of expertise available to the research and outreach teams will insure our ability to be truly community and problem driven.

The research themes of the Center include 1) assessing the physical, chemical and biological availability of contaminants in sediments, 2) evaluating and enhancing biotransformation processes in sediments, and, 3) improving the science of risk management for contaminated sediments. The overriding objective is to improve the effectiveness of remedial approaches by seeking to understand and minimize contaminant release and exposure. Toward this end, four research projects have been identified, subject to review and approval of a Scientific Advisory Committee. These projects seek to 1) evaluate the bioavailability of desorption resistant contaminants, 2) develop improved approaches for in-situ containment and treatment, 3) assess contaminant losses during removal and episodic storm events, and, 4) evaluate phytoremediation for remediation in wetlands and confined disposal facilities (CDFs).

The research program will be complimented by a technology transfer and outreach effort focused nationally on contaminated sediments and their management but regionally with respect to the broad range of hazardous substances issues that impact communities in the south and southwest. The technology transfer efforts will disseminate the research advances of the Center via both print and electronic media. The outreach efforts will focus on providing environmentally troubled communities in the region technical assistance to enable them to better understand and participate in decisions being made about their hazardous substance problems.

Objective:

The objective of the proposed Hazardous Substance Research Center/South and Southwest (HSRC/S&SW) is to provide basic and applied research, technology transfer and community outreach that address hazardous substance problems, especially the engineering management of contaminated sediments and other problems of special interest to communities within EPA Regions 4 and 6. Due to past and present toxic releases, these regions face serious hazardous substance problems and yet contain a significant fraction of the wetlands and inland waters found in the United States. The mission of the Center is to be a primary provider of the tools and process knowledge required to resolve problems posing the greatest risks to people and the environment.

Expected Results:

The direct product of the Center's research activities is an improved understanding of natural 1 fate and transport processes in sediments and how these processes can be enhanced by human action. This improved understanding will contribute to our ability to assess and manage contaminated sediments in an environmentally sound manner. The primary goal of the outreach activities is to provide information on a wide range of hazardous substance issues, including contaminated sediments, in a way that the specific public stakeholder communities can participate more actively in decisions about those issues. A secondary goal is to enhance technology transfer and outreach to the scientific and regulatory communities about Center research and programs.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Bioturbation and Bioavailability of Residual, Desorption-Resistant Contaminants

EPA Grant Number: R828773C001
Subproject: this is subproject number 001 , established and managed by the Center Director under grant R828773 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: HSRC (2001) - South and Southwest HSRC
Center Director: Danny Reible
Title: Bioturbation and Bioavailability of Residual, Desorption-Resistant Contaminants
Investigators: Danny Reible, J. Pardue, J. W. Fleeger,
Institution: Louisiana State University - Baton Rouge, LA
Rice University, Houston, TX
EPA Project Officer: Mitch Lasat
Project Period: October 1, 2001 through September 30, 2004
Project Amount: Refer to main center abstract for funding details.
Research Category: Hazardous Substance Research Centers

Approach:

The focus will be on polynuclear aromatic hydrocarbons, nonpolar hydrophobic organic compounds that are important contaminants in the sediment environment and for which the most is known as to desorption-resistance. The dynamics of uptake and fate of desorption-resistant contaminants in tubificid oligochaetes will be measured and compared to the rates and extent of contaminant release by strictly physicochemical processes. Small microcosms that have been used extensively in our laboratories will be employed. The microcosms allow a complete contaminant material balance to be collected, including assessment of organism ingestion, uptake and egestion. Both cumulative measurements and single gut passage measurements will be used to indicate contaminant fate. In addition, fecal material will be evaluated by both physicochemical means and by microbial challenges to assess the influence of digestive processing on contaminant availability.

Objective:

The overall objective of the proposed research is to evaluate the dynamics of uptake and availability of desorption-resistant contaminants to tubificid oligochaetes and the corresponding consequences to control and regulation of contaminated sediments. Physicochemical measurements suggest that some contaminants are slow or limited in their release from the sorbed state. Evaluation of the influence of these physicochemical limitations to biological availability, however, has generally been limited to microbial degradation processes which often display an asymptotic approach to a persistent residual level. A much more intense biological challenge is presented by tubificid oligochaetes that often dominate disturbed, polluted environments and which feed and burrow in the sediments and which serve as food to higher organisms. Work to-date both in our laboratories and elsewhere has demonstrated that these organisms process sediments in large quantities, enhance contaminant release from bed sediments, and can absorb and metabolize polynuclear aromatic hydrocarbons (PAH) by digestive processes from ingested sediment. These organisms can access and assimilate desorption-resistant contaminants but the rate and extent is uncertain as is the relationship to physicochemical measurements. Preliminary measurements suggest that the rate of uptake is enhanced by the metabolic processes of tubificid oligochaetes but that the ultimate extent of uptake is determined solely by equilibrium factors. It is this hypothesis that will be tested in the proposed research.

Expected Results:

The research is expected to relate physicochemical desorption resistance to biological availability in a class of organisms important to contaminated sediments. It is expected that the results will allow improved models of uptake to these organisms to be developed, ultimately improving the ability to predict food web uptake since these organisms reside at the base of benthic food webs. Ultimately, the research is expected to assist in answering questions as to required cleanup levels and the persistence of desorption resistant contaminants.

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Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

In-Situ Containment and Treatment: Engineering Cap Integrity and Reactivity

EPA Grant Number: R828773C002
Subproject: this is subproject number 002 , established and managed by the Center Director under grant R828773 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: HSRC (2001) - South and Southwest HSRC
Center Director: Danny Reible
Title: In-Situ Containment and Treatment: Engineering Cap Integrity and Reactivity
Investigators: M. Wiesner[2], Joe Hughes[2], K. T. Valsaraj[1], Billy Edge[3]
Institution: [1] Louisiana State University, Baton Rouge, LA
[2] Rice University, Houston, TX
[3] Texas A&M University, College Station, TX
EPA Project Officer: Lasat, Mitch
Project Period: October 1, 2001 through September 30, 2004
Project Amount: Refer to main center abstract for funding details.
Research Category: Hazardous Substance Research Centers

Approach:

A lab-scale flume will be constructed to study the effect of release methods, materials selection, and ambient conditions such as cross-flow and salinity on cap structure. Cap structure will be quantified in macroscopic terms using parameters such as permeability, porosity, and grain-size distribution. The micro-scale structure will be characterized in terms of the fractal dimension of the deposited mass. Experiments will be conducted under conditions of stagnant deposition (column studies) using suspensions of particles ranging in size from approximately 1 m to 1 mm. Mixtures of particle sizes will be investigated including deposition of fine particles onto a gravel substrate. Various surface treatments for the capping material will be investigated through the addition of polymeric materials. Changes in capping material surface chemistry (adhesion probability and adsorptive capcity) will be quantified.

In parallel with this work, simulations of particle deposition will be performed using Lagrangian methods in which the trajectories of individual particles are calculated from second-law principles. This involves the integration of the individual stochastic equations for particle motion and the calculation of individual particle trajectories from randomly selected release points over the surface. Computer models based on Monte Carlo techniques will be developed to investigate particle deposition in 3-dimensional Euclidean space on a plane. Characteristics of the simulated caps will be compared with experimentally determined characteristics to better understand limitations in the numerical model. It is hoped that such a comparison will lead to reasonable predictions of deposit morphology as function of fundamental physico-chemical parameters for a given cap-forming technique.

Objective:

Contaminant transport and fate in sediment caps is dependent on the structure of the sediment cap, which in turn depends upon the methods used to construct the cap. Current approaches to constructing sediment caps largely focus on stabilizing or isolating underlying contaminated materials. However, variations in current construction techniques may lead to variations in contaminant transport across the cap, as well as differences in cap aging, stability and permeability. The construction of second-generation "reactive" caps will likely require a more sophisticated understanding and control of the depositional processes involved in constructing a cap. This research will address fundamental processes controlling sediment deposition as they affect the engineering of sediment caps as currently practiced, and as applied to the development of advanced capping technologies. We will test the hypothesis that the surface chemistry of conventional capping materials can be altered to achieve a desired cap structure and/or reactivity.

Expected Results:

This work will allow us to form caps with a desired set of characteristics. Better control over cap formation and methods for constructing caps where the micro- and nano-scale properties of the cap can be designed will improve our ability to control transport and targeted reactivity of contaminants within the cap. Such improvements will allow for better long-term containment and remediation of hazardous materials in sediments.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Phytoremediation in wetlands and CDFs

EPA Grant Number: R828773C003
Subproject: this is subproject number 003 , established and managed by the Center Director under grant R828773 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: HSRC (2001) - South and Southwest HSRC
Center Director: Danny Reible
Title: Phytoremediation in wetlands and CDFs
Investigators: J. Pardue
Institution: Louisiana State University, Baton Rouge, LA
EPA Project Officer: Mitch Lasat
Project Period: October 1, 2001 through September 30, 2004
Project Amount: Refer to main center abstract for funding details.
Research Category: Hazardous Substance Research Centers

Approach:

Initial mechanistic studies will be conducted in greenhouse mesocosms using herbaceous wetland vegetation with known differences in detrital pathways (Phragmites and Typha). Studies will test the hypotheses above by assessing daughter product (lower chlorinated benzene) concentrations and bulk redox conditions in rhizosphere to infer whether reductive dechlorination reactions are occurring. Intensity and capacity measurements of terminal electron accepting processes will determine the potential for a range of geochemical conditions in the rhizosphere. Measurements of detrital decomposition products (organic acid and ambient H2 concentrations) will be linked with the population dynamics of reductive dechlorination organisms in the rhizosphere. To test the second hypothesis that rhizospheric biodegradation processes are the key fate process, additional experiments will be conducted in collaboration with faculty and students at Southern University. The rate and extent of wetland plant uptake of lower chlorinated benzenes from well-characterized organic wetland sediments will be assessed. with realistic contaminant loadings (known amounts of readily available and desorption-resistant ("aged") chlorobenzene fractions) Test soils will be prepared with contaminant aging techniques developed in our previous work with these compounds. Identification of chlorobenzene sorption/desorption properties on roots will also be performed. These studies represent an extension of a working relationship developed during a previous HSRC project and will provide Southern with capabilities to perform tracer plant uptake experiments, the basis for many phytoremediation treatability studies.

Objective:

Hydrophobic chlorinated organics such as hexachlorobenzene are common sediment contaminants that pose a threat to sensitive receptors. These compounds are recalcitrant in sediments and bioaccumulate through the food chain. By contrast, rapid contaminant attenuation for certain chlorinated organics is observed in vegetated sediments (i.e., wetlands). In these sediments, enhanced biological processes (aerobic and anaerobic biodegradation and plant uptake) have been observed in the root zone that drives rapid natural recovery. Previous research has indicated that herbaceous wetland vegetation stimulates degradation of chlorinated organics primarily via rhizospheric biodegradation processes. It can be hypothesized that reductive dechlorinating populations are stimulated in the rhizosphere by formation of specific organic acids (i.e., propionate) during detrital processes. The presence of certain organic acids has been shown to stimulate reductive dehalogenating organisms by favorably controlling the ambient level of H2 in porewater. The formation of high concentrations of these organic acids in marshes with Phragmites vegetation has been observed, while not in other marsh vegetation types such as Typha. This microbial-vegetation interaction may represent the "mechanism" by which rapid natural attenuation occurs in these wetland systems. Based on these hypotheses, the objectives of the proposed study are to: define the biodegradation potential of chlorobenzenes by quantifying biogeochemical conditions in the rhizosphere. Key conditions include the specific detrital decomposition products (organic acids and hydrogen) in several contrasting wetland plant types. A second objective of the study will define other potential fate mechanisms: plant uptake and volatilization by studying the dynamics of plant uptake of chlorobenzenes in wetland sediments.

Expected Results:

The study will provide information on a common contaminant scenario in wetland sediments in the region. Understanding the potential for wetland bioremediation would impact a number of locations where natural recovery is a proposed solution. The expected results are that specific microbial-wetland vegetation interactions will be shown to exist, for example, the stimulation of chlorobenzene dechlorinating population in the rhizosphere of Phragmites. This information may spur development of new technologies for sediment remediation (a constructed wetland approach for confined disposal facilities, for example).

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

Contaminant Release During Removal and Resuspension

EPA Grant Number: R828773C004
Subproject: this is subproject number 004 , established and managed by the Center Director under grant R828773 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: HSRC (2001) - South and Southwest HSRC
Center Director: Danny Reible
Title: Contaminant Release During Removal and Resuspension
Investigators: Mason B. Tomson[2], Louis J. Thibodeaux[1]
Institution: [1] Louisiana State University - Baton Rouge, LA
[2] Rice University, Houston, TX
EPA Project Officer: Mitch Lasat
Project Period: October 1, 2001 through September 30, 2004
Project Amount: Refer to main center abstract for funding details.
Research Category: Hazardous Substance Research Centers

Approach:

Uncontaminated and contaminated sediments will be obtained from rivers or bayous in LA coordinated by Louis Thibodeaux. Sediment samples and redox conditions will be preserved as undisturbed as possible. Several different sediments, characterized as having different representative sediment properties (see proposal for details) will be used. Associated or overburden water will either be used directly or simulated in the laboratory. Next, experimental methods similar to the US Army Corps WES DRET method will be performed in the laboratory. These initial experiments will yield solution phase concentrations of metals versus time. Results of these preliminary batch experiments with field sediments will be used as the baseline metal release rates. The impact of known changes in sediment/solution conditions during resuspension will be simulated with these field sediments, including redox and dissolved oxygen, pH, ionic strength, and temperature. The effect of individual parameters on heavy metal sorption and desorption will be studied in batch experiments based upon the results of these tests with actual contaminated sediments. With laboratory contaminated sediments, multistep sorption experiments will be performed to systematically saturate specific binding sites on the solid. Once the range of interest for a particular contaminant-solid combination has been identified the method of "constant composition" desorption will be used for a few combinations to obtain precise stoichiometry, kinetics, and equilibrium information at fixed chemical potential driving force. Key samples will be used for extensive characterization by modern surface methods, such as atomic force microscopy (AFM) and extended range XAFS (EXAFS).

Objective:

In resuspension of contaminated sediments during dredging heavy metals, such as Pb, Cd, Cu, and As, represent several special challenges and will be the focus of this HSRC research. During resuspension generally the largest physical-chemical effect, with respect to heavy metal sorption, is the change in redox of the freshly disturbed sediments. At the point of dredging the sediments are suspended in the river bottom and there is an immediate increase in solid surface area and corresponding immediate change in the physical chemical parameters that characterize the water. Following these immediate changes there will be several time scales that are applicable, 1. the slower redox processes; 2. the desorption kinetics; and 3. the relative rates of redeposition of the sediment particles. The objective of this study is to understand the dynamics and kinetics of heavy metal release processes.

Expected Results:

The relative interplay between immediate physical-chemical changes, redox, heavy metal desorption, and redeposition for real sediments will be modeled by changing one parameter at a time. Change in solution and solid surface redox is expected to be the most important parameter controlling heavy metal release during dredging. How this redox varies and thereby alters the kinetics of heavy metal release is not known, but is probably related to sediment properties such as sulfide/oxide content and to sediment organic matter. Once key descriptors have been identified, simplified assays and predictors will be developed for routine use. The final hypothesis to be tested is that sorption and desorption of heavy metals can be modeled using readily available or measurable properties of sediments and dredged materials along with properties of potentially impacted surface water bodies. Understanding the key physical and chemical parameters that affect heavy metal desorption during dredging and resuspension will enable regulators and field practitioners to use only a few key sediment/water parameters and reliably predict the environmental risk in specific dredging operations.

Type: HAZARDOUS SUBSTANCE RESEARCH CENTER
Status: Ongoing
Reports: No Reports Available Yet

HSRC Technology Transfer, Training and Outreach

EPA Grant Number: R828773C005
Subproject: this is subproject number 005 , established and managed by the Center Director under grant R828773 (EPA does not fund or establish subprojects; EPA awards and manages the overall grant for this center).
Center: HSRC (2001) - South and Southwest HSRC
Center Director: Danny D. Reible
Title: HSRC Technology Transfer, Training and Outreach
Investigators: Leigh Fitzpatrick[1], Bob Schmitter[1], Denise Rousseau Ford[2]
Institution: [1] Georgia Institute of Technology, Atlanta, GA
[2] Louisiana State University, Baton Rouge, LA
EPA Project Officer: Mitch Lasat
Project Period: October 1, 2001 through September 30, 2004
Project Amount: Refer to main center abstract for funding details.
Research Category: Hazardous Substance Research Centers

Approach:

The technology transfer activities will include the continued development and promotion of an online Sediments Research Community, which will be maximized to reach as many of the participants as possible while engaging them in meaningful interaction through chats where appropriate and on-line learning materials. Additional technology transfer activities include further development of web-based resources such as workshops and fact sheets, particularly as they relate to new research and information regarding the management of contaminated sediments, sponsorship of regular workshops and conferences, distribution of Research Briefs ? one page fact sheets summarizing research objectives and progress, and development and dissemination of an electronic newsletter. The Center also proposes to transfer technology developed in research projects through field demonstration activities, coordinated by the Center Director. Separate funding will be sought in order to leverage these resources.

The Center's outreach activities to environmentally troubled communities will assist those communities in understanding the contaminants that threaten them so they may participate fully in site remediation efforts. The outreach program maintains a toll-free hotline for use by community members to access HSRC outreach assistance, and disseminates this number and information regarding the assistance activities to EPA regional offices, community action networks, and local municipalities. This programmatic activity includes site visits, evaluation of technical documents, participation in public meetings, and development of web and printed resources.

The outreach component will continue to serve long-term TOSC communities in Regions 4 and 6, while assisting with new communities and needs. In addition, TOSC will increase its presence and assistance abilities by hosting a forum for similarly situated communities to exchange information and resources via the Internet, developing technical documents addressing community-specific environmental issues, and developing a network of expertise capable of responding to localized needs in a timely manner. This network will encompass technical assistance providers at the primary institutions (GTRI, Rice, LSU, and Texas A&M), plus affiliated Minority Academic Institutions and Historically Black Colleges and Universities. Other proposed projects include partnering with Howard University to provide training for the U.S. Conference of Black Mayors. The S&SW Center will continue to work with the Technical Outreach Services to Native American Communities in an effort to gain increased interaction with tribal communities, particularly in Region 6, as a focus for year one of this effort.

Objective:

The S&SW Center's Technology Transfer, Training, and Outreach program is designed to disseminate research advances and technical information and assistance to public and private sector audiences. These audiences encompass those who are responsible for management and oversight of hazardous substance clean-up projects and those community members living in and around these sites. Targeted audiences include environmentally troubled communities, state environmental regulatory staff, public officials, U.S. Environmental Protection Agency regional staff, environmental contractors, industry, other research institutions, and private sector organizations involved in hazardous substance management.

The S&SW Center utilizes a variety of methods to disseminate this information, including: the Internet and world wide web, training workshops, research symposia, conferences, traditional publications, site assistance visits, environmental exhibitions, and public hearings. This Center has historically developed partnerships with organizations including ATSDR, AEPI, the Sediment Management Workgroup, and the Army Corps of Engineers to meet the goals of sharing information and knowledge with other relevant communities.

Section 4.0

Topic Index

TOPIC INDEX

Note: The index headings listed here are for the most part those appearing with the STAR abstracts as "Supplemental Keywords." The numbers after each topic refer to the STAR reference numbers in the black boxes at the top right of each abstract sheet found in this book.

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