



# Green Chemistry Program Fact Sheet



## GREEN CHEMISTRY

### What Is Green Chemistry?

Green chemistry is reducing or eliminating the use or generation of hazardous substances—including feedstocks, reagents, solvents, products, and byproducts—from a chemical process. Green chemistry encompasses all aspects and types of chemical processes—including synthesis, catalysis, analysis, monitoring, separations, and reaction conditions—that reduce negative impacts on human health and the environment.

### Green Chemistry Focus Areas

Green chemistry technologies can be categorized into one or more of the following three focus areas:

- The use of alternative synthetic pathways for green chemistry
- The use of alternative reaction conditions for green chemistry
- The design of chemicals that are, for example, less toxic than current alternatives or inherently safer with regard to accident potential.

By offering environmentally benign alternatives to the more hazardous chemicals and processes that are often used in both consumer and industrial applications, green chemistry is promoting pollution prevention at the molecular level.

## Chemistry Designed for the Environment

### The Green Chemistry Program

Green Chemistry is the use of chemistry for pollution prevention. More specifically, green chemistry is the design of chemical products and processes that are more environmentally benign. By reducing or eliminating the use or generation of hazardous substances associated with chemical design, manufacture, and use, chemists can greatly reduce risk to human health and the environment. This new approach to pollution prevention through the environmentally conscious design of chemical products and processes is the central focus of EPA's Green Chemistry Program, an initiative under the EPA Design for the Environment Program.

### How Was The Green Chemistry Program Initiated?

Shortly after the passage of the Pollution Prevention Act of 1990, EPA's Office of Pollution Prevention and Toxics (OPPT) began to explore the idea of developing new or improving existing chemical products and processes to make them less hazardous to human health and the environment. In 1992, OPPT launched a model research grant program called "Alternative Synthetic Pathways for Pollution Prevention". This program provided, for the first time, grants for research projects that include pollution prevention in the synthesis of chemicals. Since that time the Green Chemistry Program has built collaborations with many partners to promote pollution prevention through green chemistry. Partnering organizations represent academia, industry, other government agencies, scientific societies, trade organizations, national laboratories, and research centers.

### What Is EPA Doing To Promote Green Chemistry?

The goal of EPA's Green Chemistry Program is to foster the research, development, and implementation of innovative chemical technologies that accomplish pollution prevention in both a scientifically sound and cost-effective manner. To accomplish its goals, the Green Chemistry Program recognizes and promotes chemical technologies that reduce or eliminate the use or generation of hazardous substances during the design, manufacture, and use of chemical products and processes and that have broad application in industry. More specifically, the Green Chemistry Program supports fundamental research in the area of environmentally benign chemistry as well as a variety of educational activities, international activities, conferences and meetings, and tool development. The program is composed of four major projects including Green Chemistry Research, the Green Chemistry Challenge, Green Chemistry Education activities, and Scientific Outreach.



## **Green Chemistry Research**

EPA's Green Chemistry Program supports fundamental research in green chemistry in order to provide the chemically-viable tools and methods necessary to develop products and processes that are more environmentally benign. In 1992, EPA awarded six grants to fund basic research projects that considered impacts to human health and the environment in the design of chemical syntheses. In 1992 and 1994, EPA's Office of Pollution Prevention and Toxics and Office of Research and Development, respectively, signed Memoranda of Understanding with the National Science Foundation (NSF) to jointly fund green chemistry research. These initial activities were the beginning of the establishment of a number of research opportunities that have, to date, awarded tens of millions of dollars in grants for fundamental research in green chemistry. These opportunities include a number of industry/university/government consortia as well as an annual "Technologies for a Sustainable Environment" solicitation. EPA's Small Business Innovation Research Program (SBIR) has also expanded its solicitation to include green chemistry research grants for small businesses.

## **Green Chemistry Challenge**

The Green Chemistry Challenge promotes pollution prevention and industrial ecology through an EPA Design for the Environment partnership with the chemistry community. Through high level recognition and support, the Green Chemistry Challenge promotes innovative developments in and uses of green chemistry for pollution prevention. The Green Chemistry Challenge recognizes outstanding accomplishments in green chemistry through an annual awards program and promotes innovative research in green chemistry. The technologies recognized and supported by the Green Chemistry Challenge directly reduce risks to human health and the environment by reducing the hazards associated with the design, manufacture, and use of chemicals.

## **Green Chemistry Education Activities**

One factor that can greatly speed the incorporation of pollution prevention into industrial and academic chemical activities is addressing pollution prevention issues in chemistry curricula. As part of these scientific outreach efforts aimed at promoting widespread pollution prevention practices, it is imperative that chemists be formally educated about pollution prevention concepts during both their academic and professional training. To accomplish this goal, EPA's Green Chemistry Program supports a variety of educational efforts that include the development of materials and courses to assist in the training of professional chemists in industry and the education of students in academia. EPA's partners in these efforts include the National Pollution Prevention Center (NPPC) at the University of Michigan, the Partnership for Environmental Technology Education (PETE), and the American Chemical Society (ACS).

## **Scientific Outreach**

In order for pollution prevention through green chemistry to become a standard in industry and academia, both the concept and the science must be effectively communicated to all sectors of industry, at all levels of chemical education, and to the scientific community in general. EPA's Green Chemistry Program supports a number of outreach projects that include participating in and organizing prominent scientific meetings and workshops such as the annual National Green Chemistry and Engineering Conference and its affiliated workshops, as well as the annual Gordon Research Conference on Green Chemistry; publishing in scientific journals and books; and developing and disseminating computational tools and databases.

**For further details and future updates, visit  
EPA's Green Chemistry Program Web Site at  
<http://www.epa.gov/greenchemistry>**

