



Project Summary

Sources of Copper Air Emissions

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A study was conducted to update estimates of atmospheric emissions of copper and copper compounds in the U.S. Source categories evaluated included: metallic minerals, primary copper smelters, iron and steel, combustion, municipal incineration, secondary copper smelters, copper compound production, iron foundries, primary lead smelters, primary zinc smelters, ferroalloys, brass and bronze, and carbon black. The study relied on data contained in published literature, supplemented by EPA test reports and data bases. The approach used to assess each source category involved: (1) estimating total particulate emissions, including fugitives; (2) determining the effect of air pollution control on emissions; (3) estimating the proportion of copper contained in the total particulates; and (4) estimating copper emissions. Copper emissions estimates are presented for each source category.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

This report provides preliminary information on sources of air emissions of copper and copper compounds. The 13 source categories examined in this study were metallic minerals, primary copper smelters, iron and steel, combustion, municipal incinerators, secondary copper smelters, copper compounds, iron foundries, primary lead smelters, primary zinc smelters, ferroalloys, brass and bronze, and carbon black.

The collection of information for this study concentrated on existing EPA and

open-literature documents. These were supplemented with examinations of EPA test reports and data bases (e.g., FPEIS) for additional data.

The purpose of this study was to collect information on the air emission sources of copper and copper compounds. These sources were characterized by copper emission quantities and stack parameters (e.g., height, flow, and temperature) on individual plants, where possible. Each point source within the plant was characterized.

Sources of Copper Emissions

The following sources of atmospheric emissions of copper and copper compounds were investigated:

Copper mining and milling

Primary copper

Roasting

Reverberatory furnace

Converters

Materials handling

Secondary copper

Scrap production

Wire burning

Sweating furnace

Blast furnace

Smelting, reverberatory

Smelting, rotary

Iron and steel

Blast furnace

Open hearth furnace

Basic oxygen furnace

Electric arc furnace

Gray iron foundries

Miscellaneous copper metals
and alloys

Miscellaneous copper chemi-
cals and products

Incinerators

Combustion sources

Utility boilers

Coal-fired

Oil-fired

Industrial boilers
 Coal-fired
 Oil-fired
 Residential/commercial boilers
 Coal-fired
 Oil-fired

Study Methodology

The approach used to assess each source category for copper emissions involved estimating total particulate emissions, determining current control technologies and emission reduction, and estimating copper emissions. Each step is discussed below.

The estimation of total particulate emissions was a necessary first step because most of the copper data were in the form of weight percentages of particulate matter. Total particulate emissions (both process and fugitive) from each facility in a source category were estimated using emission factors derived from either EPA summary reports or EPA source test measurements. In some cases, such as iron foundries, where individual plants were too numerous to allow a plant-by-plant emission estimate, total nationwide emissions were estimated.

For most source categories, individual plant-specific control devices were used to estimate controlled particulate emissions. For some source categories, an overall control efficiency was assumed. This assumption was made because of either a large number of sources (e.g., combustion) or a lack of individual plant process or control device data (e.g., brass and bronze).

In most cases, copper weight percentage factors were applied to controlled particulate emissions. Thus, the obvious assumptions were made that copper was present in the form of particulate matter

and was controlled at the same efficiency. In a few cases, actual copper control efficiencies were available.

Study Results

The following table summarizes the estimates of copper emissions from the source categories investigated. These estimates are provided as ranges which represent the variability found in the available data.

Source	Estimated Copper Emissions (10 ³ kg/yr)
Copper and iron ore processing	480 - 660
Primary copper smelting	43 - 6,000
Iron and steel making	112 - 240
Coal and oil combustion	45 - 360
Municipal incineration	3.3 - 270
Secondary copper smelting	160
Miscellaneous sources	
Copper sulfate production	45
Gray iron foundries	7.9
Primary lead smelting	5.5 - 65
Primary zinc smelting	24 - 340
Ferroalloy production	1.9 - 3.2
Brass and bronze production	1.8 - 36
Carbon black production	13

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The complete report, entitled "Sources of Copper Air Emissions," (Order No. PB 85-191 138/AS; Cost: \$11.50, subject to change) will be available only from:

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 5285 Port Royal Road
 Springfield, VA 22161
 Telephone: 703-487-4650*

The EPA Project Officer can be contacted at:

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