

toxics release inventory

Chemical Profile

*Environment
Science & Technology Development*

Copper

What is copper?

Copper (Cu) is a shiny reddish metal that is easily molded. In nature, copper combines with other elements to form copper compounds. Small amounts of copper are naturally present in soils, rocks, water, and underwater sediments.

Copper combines with other metals to form mixtures called alloys. For example, copper mixed with zinc forms the common alloy, brass. Because it is an excellent conductor, copper is used in electrical wiring and cooking utensils. It is also used in plumbing pipes, sheet metal, anti-fouling paints that control barnacles, chemical and pharmaceutical equipment, and coins. Copper compounds, such as copper sulfate, are used as fungicides to control mildew on crops, water treatment additives to control algae, and wood preservatives.

How is copper released by electric utilities?

Trace amounts of copper are present in coal and oil. When electric utilities burn these fuels at their power plants, copper is released in very small amounts. Most of this copper is carried by particles of ash.

Coal-burning power plants are equipped with devices to capture these particles before they reach the air. Particle control devices typically capture more than 99% of the ash, so very little ash enters the air. Copper-carrying ash

captured by these devices is usually sent to ash ponds or land disposal sites.

Copper may also be present in water discharged from power plants. Many plants have copper plumbing and heat exchangers with copper parts. Corrosion or erosion of these fixtures releases copper into cooling water passing through them. To reduce copper releases, some utilities are installing titanium or stainless steel fixtures.

The amount of copper that U.S. power plants release into the environment each year is presently unknown.

Is copper also released by other sources?

Copper is released into the air by soils as they erode in wind and rain, and by volcanoes when they erupt. It is released into water and soil by eroding rocks and ores. These natural releases are smaller than those from human activities.

Copper released by human activities comes mainly from copper mines and smelters, metal production facilities, boilers that burn fossil fuels, incinerators that burn refuse and sewage sludge, and water treatment facilities that use copper compounds to control algae. Industries reporting to the U.S. Environmental Protection Agency (EPA) released 4222 tons of copper into the environment in 1996. About 60% was released to the air.

What happens to copper after it is released by electric utilities?

Ash particles carrying copper settle to the ground after they are released into the air from power plants. Copper compounds that dissolve in water are carried to the ground by rain and snow. Other copper compounds that don't dissolve reach the ground through gravity and air turbulence. Copper can build up in the flesh of fish.

Ash pond wastewater and cooling wastewater discharged into public waterways may contain small amounts of copper, but these amounts are regulated by local permits.

How might people be exposed to copper?

People are commonly exposed to small amounts of copper naturally present in the foods they eat and the water they drink. Drinking tap water that stands in copper pipes or brass faucets, or eating fish that accumulate copper in their flesh, can increase exposure. People may breathe particles in the air that carry trace amounts of copper, and industrial workers may breathe copper dust or fumes, or touch substances that contain copper.

What are the potential effects of copper on human health?

Very small amounts of copper in people's diets are necessary for good health. However, eating or drinking large amounts of copper can cause stomach and intestinal distress, liver and kidney damage, and anemia. Very young children, and people with hereditary Wilson's disease that causes their bodies to retain too much copper, are particularly sensitive to these effects. Fortunately, people can usually taste copper in drinking water before it reaches harmful levels.

Breathing large amounts of copper dust or fumes irritates the respiratory tract and causes short-term effects that feel like the flu. Touching copper can cause skin allergies. Although research is ongoing, copper has not been found to cause cancer in people.

How likely is it that utility releases pose a risk to human health?

It is unlikely that copper from power plants poses a significant risk to human health. EPA has not evaluated the potential health risks of breathing copper for people who live near power plants that burn coal or oil. In case studies to date, EPRI has found no health risks associated with exposure to copper released by utilities into the air, water, or soil.

EPRI has found that ash from power plants typically has about nine times as much copper as the soil. It is unlikely that ash from power plants significantly increases the amount of copper in soils, water, or food, because airborne ash particles carrying copper are widely scattered before they settle to the ground.

How is copper regulated?

EPA has established limits for copper in drinking water, and has published water quality standards to protect freshwater life, such as fish, from exposure to copper. Under the National Pollutant Discharge Elimination System, federal and state regulators determine how much copper each power plant may release in wastewater discharges. The Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health have set limits on the amount of copper in workplace air.

Where can I get more information about copper?

The Agency for Toxic Substances and Disease Registry (ATSDR) has a public health statement with answers to frequently asked health questions about copper. It is available through the ATSDR Information Center at 1-800-447-1544, or on the Internet at <http://atsdr1.atsdr.cdc.gov:8080-/ToxProfiles/p9008.html>