

# Technical Factsheet on: COPPER

## [List of Contaminants](#)

As part of the Drinking Water and Health pages, this fact sheet is part of a larger publication:  
**National Primary Drinking Water Regulations**

### **Drinking Water Standards**

MCLG: 1.3 mg/L

Action Level: > 1.3 mg/L in 10 percent or more of tap water samples

HAL(child): none

### **Health Effects Summary**

Acute and Chronic: Copper is an essential nutrient, but at high doses it has been shown to cause stomach and intestinal distress, liver and kidney damage, and anemia. Persons with Wilson's disease may be at a higher risk of health effects due to copper than the general public.

Cancer: There is inadequate evidence to state whether or not copper has the potential to cause cancer from a lifetime exposure in drinking water.

### **Usage Patterns**

Copper occurs in drinking water primarily due to its use in plumbing materials.

Occurrence in Source Water and Distributed Water. Copper levels above the MCLG are rarely found in raw drinking water supplies or in distributed water. EPA estimates that only 66 water systems have copper levels in source water greater than the MCLG.

Occurrence as a Corrosion By- Product. The primary source of copper in drinking water is corrosion of copper pipes, which are widely used throughout the United States for interior plumbing of residences and other buildings. In some cases, copper is a component of additives to drinking water used by systems to control the growth of algae.

### **Release Patterns**

Although copper rarely occurs in source water, the following natural and artificial sources have been identified. Copper is widely distributed in nature in the elemental state, in sulfides, arsenites, chlorides, and carbonates. The element is only superficially oxidized in air, sometimes giving a green coating of hydroxy carbonate and hydroxy sulfate. The concentration of copper in the continental crust, generally estimated at 50 ppm, tends to be highest in the ferromagnesium minerals, such as the basalts pyropene and biotite, where it averages 140 ppm. Sandstones contain 10-40 ppm, shales 30-150 ppm, and marine black shales 20-300 ppm. Coal is relatively low in copper.

In the sedimentary cycle copper is concentrated in the clay mineral fractions with a slight enrichment in those clays rich in organic carbon.

Smelting operations and municipal incineration may also produce copper. Water and pasture have been found to be contaminated with copper in the vicinity of copper mines or smelting works. The principal source of elevated copper levels in air is copper dust generated by copper processing operations.

From 1987 to 1993, according to the Toxics Release Inventory copper compound releases to land and water totalled nearly 450 million lbs., of which nearly all was to land. These releases were primarily from copper smelting industries. The largest releases occurred in Utah. The largest direct releases to water occurred in Tennessee.

### Environmental Fate

As with lead, all water is corrosive toward copper to some degree, even water termed noncorrosive or water treated to make it less corrosive. Corrosivity toward copper depends primarily on the pH of the water, with very low pHs associated with the highest levels of copper corrosion by-products. Many of the other factors that affect the corrosivity of water toward lead can also be expected to affect the corrosion of copper.

### Chemical/Physical Properties

CAS Number: 7440-50-8 (metal)

Color/Form/Odor: Reddish metal which may occur in water as copper salts, the most common of which are the chloride, nitrate and sulfate salts.

Soil sorption coefficient: N/A

Solubilities (g/L water at 20 deg C): Chloride, 770; Nitrate, 1250; Sulfate, 207.

Bioconcentration Factor: N/A

Common Ores: Found as sulfides, arsenites, chlorides, and carbonates in the following ores: Chalcopyrite, Chalcocite, Bornite, Tetrahedrite, Enargite, Antlerite

### Other Regulatory Information

Monitoring:	<u>For Copper</u>	<u>For Water Quality Parameters</u>	
Sampling Site:	At Home Taps	Within the Distribution System	At Entry to the Distribution System
<b>Monitoring Period:</b>			
Initial	Every 6 months	Every 6 months	Every 6 months
After corrosion control installation	Every 6 months	Every 6 months	Every 2 weeks
<b>Reduced monitoring</b>			
- Conditional	Once a year	Every 6 months	Every 2 weeks
- Final	Every 3 years	Every 3 years	Every 2 weeks

### Analysis

<u>Reference Source</u>	<u>Method Number</u>
EPA 800/4-83-043	220.2; 220.1
Standard Methods	3111-B; 3120

### Treatment/Best Available Technologies

Source water: Ion exchange; lime softening; reverse osmosis; coagulation/filtration

Corrosion Control: pH and alkalinity adjustment; calcium adjustment; silica- or phosphate-based corrosion inhibition

**Toxic Release Inventory - Releases to Water and Land, 1987 to 1993 (in pounds):**

	<b>Water</b>		<b>Land</b>
<b>TOTALS</b>	<b>1,538,148</b>		<b>442,082,245</b>
<b>Top Ten States *</b>			
UT	55,350	153,501,500	
NM	0	130,682,387	
AZ	2,636	104,619,532	
MI	19,763	11,172,897	
NY	66,57	10,017,766	
MT	0	8,696,153	
TN	301,417	1,208,804	
MO	250	1,486,000	
AL	41,213	513,536	
MD	78,601	270,945	
<b>Major Industries*</b>			
Primary copper smelting		7,591	201,214,264
Other nonferrous smelt.		4,414	11,317,048
Plastic materials		44,422	9,637,850
Blast furnaces, steel		156,982	3,229,752
Poultry slaughtering		0	1,249,750
Copper rolling, drawing		17,253	941,075
Ind. organic chems		28,936	827,356
Prepared feeds, misc.		1,038	760,094
Ind. inorganic chems		220,503	527,458

\* State/Industry totals only include facilities with releases greater than a certain amount - usually 1000 to 10,000 lbs.

**For Additional Information:**

EPA can provide further regulatory and other general information:  
EPA Safe Drinking Water Hotline - 800/426-4791

Other sources of toxicological and environmental fate data include:  
Toxic Substance Control Act Information Line - 202/554-1404  
Toxics Release Inventory, National Library of Medicine - 301/496-6531  
Agency for Toxic Substances and Disease Registry - 404/639-6000