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Title: **IMPROVING THE METHODOLOGY OF TEACHING EXPERIMENTS ON THE ELEMENTS OF THE COPPER GROUP AND ITS COMPOUNDS**

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## IMPROVING THE METHODOLOGY OF TEACHING EXPERIMENTS ON THE ELEMENTS OF THE COPPER GROUP AND ITS COMPOUNDS

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**Abstract:** This article discusses the improvement of teaching methods for experiments on the elements of the copper group and its compounds, the nature and importance of the element copper, as well as its use.

**Keywords:** elements of copper group, teach, methods, chemical elements, use, experiments.

### Introduction

Copper is a chemical element with the atomic number 29 and the symbol Cu (from Latin: cuprum). It's a ductile, malleable metal with excellent thermal and electrical conductivity. A freshly exposed pure copper surface is pinkish-orange in hue. Copper is used as a heat and electricity conductor, a building material, and a component of numerous metal alloys, including sterling silver for jewelry, cupronickel for nautical hardware and coins, and constantan for strain gauges and thermocouples for temperature monitoring.

Metals can be categorized based on their reactivity. Some elements, such as sodium, are sufficiently reactive that they explode when they come into touch with water. Some, such as gold, are so inert that they appear to have remained unchanged for thousands of years after being buried. On this scale, copper is at the bottom. It will react, but it will do so slowly. It is appropriate for usage in architecture because of its low reactivity and malleability. It can be hammered and cut into ornate shapes, and it is protected by a patina, a pale green coating of copper salts. Note that this is not to be confused with verdigris, which is the name given to the green finish created by treating copper acetate with acetic acid. Verdigris is a soluble metal that is not as toxic as lead.

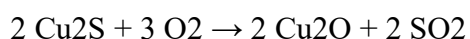
Copper is one of the few metals that may be found in a useful metallic state in nature (native metals). From around 8000 BC, this resulted in extremely early human use in numerous places. It was the first metal to be smelted from sulfide ores, around 5000 BC; the first metal to be cast into a shape in a mold, around 4000 BC; and the first metal to be alloyed with another metal, tin, to become bronze, around 3500 BC.

### Main part

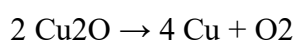
Copper was mined mostly on Cyprus, which gave the metal its name, aescyprum (metal of Cyprus), which was later distorted to cuprum (Latin). This gave rise to the words coper (Old English) and copper, with the latter spelling first appearing around 1530. Copper(II) salts, which often lend blue or green tints to minerals like azurite, malachite, and turquoise, and have been used widely and historically as pigments, are among the most commonly encountered compounds. Copper used in structures oxidizes to generate a green verdigris, which is frequently used for roofing (or patina). Copper, both in its elemental metal form and as pigments, is occasionally employed in decorative art. Bacteriostatic agents, fungicides, and wood preservatives are all made from copper compounds.

Copper is a trace dietary mineral that is required by all living creatures since it is a component of the respiratory enzyme complex cytochrome c oxidase. Copper is a component of the blood pigment hemocyanin in mollusks and crustaceans, but it is replaced by iron-complexed hemoglobin in fish and other vertebrates. Copper is primarily found in the liver, muscle, and bone in humans. Copper levels in adults range between 1.4 and 2.1 milligrams per kilogram of body weight.

Most commercial ores are sulfides, particularly chalcopyrite ( $\text{CuFeS}_2$ ), bornite ( $\text{Cu}_5\text{FeS}_4$ ), and to a lesser extent, covellite ( $\text{CuS}$ ) and chalcocite, with copper concentrations averaging only 0.6 percent ( $\text{Cu}_2\text{S}$ ). In contrast, the average copper concentration in polymetallic nodules is estimated to be 1.3 percent. Sulphuric leaching, smelting, and the Cuprion process are among of the processes used to extract copper and other metals from these nodules. Minerals present in land ores are concentrated to a level of 10–15 percent copper by froth flotation or bioleaching from crushed ores. Much of the iron is removed as slag when this material is heated with silica in flash smelting. The technique takes use of the ease with which iron sulfides may be converted into oxides, which then react with silica to generate the silicate slag that floats on top of the heated mass. The resulting copper matte, consisting of  $\text{Cu}_2\text{S}$ , is roasted to convert all sulfides into oxides:



The cuprous oxide is converted to blister copper upon heating:



Only half of the sulfide was converted to oxide in the Sudbury matte process, which was then utilized to extract the remaining sulfur as oxide. It was then electrolytically purified, and

the platinum and gold contained in the anode mud were extracted. This procedure takes advantage of copper oxides' comparatively simple reduction to copper metal. Natural gas is blasted over the blister to remove the majority of the remaining oxygen, and the resulting material is electrorefined to yield pure copper:  $\text{Cu}_2 + 2 e^- \rightarrow \text{Cu}$ .

Copper was the first metal that humanity worked with in history. The Bronze Age was named after the discovery that it could be hardened with a little tin to make the alloy bronze. Along with silver and gold, it has traditionally been one of the metals used to manufacture coins. It is, however, the most common of the three and thus the least valuable. Copper alloys are currently used in all US coins, and gun metals use copper as well. Copper is mostly utilized in electrical equipment like wire and motors. This is due to the fact that it transmits heat and electricity well and can be dragged into wires.

It's also used in building (for example, roofing and plumbing) and industrial machines (such as heat exchangers).

Copper sulfate is frequently employed as an agricultural toxin and in water treatment as an algicide. Copper compounds, such as Fehling's solution, are employed in sugar detection chemical assays. Copper is a necessary element for life. To help enzymes transport energy in cells, an adult human need about 1.2 milligrams of copper every day. Copper in excess is poisonous. Wilson's illness and Menkes' disease are two genetic diseases that can damage the body's capacity to utilise copper effectively. Unlike humans, which utilize iron (in the form of haemoglobin) to carry oxygen throughout their bodies, some crustaceans use copper complexes to do so. Copper is found naturally, although minerals like chalcopyrite and bornite are by far the most common sources. Smelting, leaching, and

electrolysis are used to extract copper from these ores and minerals.

### **Conclusion**

In the conclusion, often when we explain a lesson topic to students through a variety of scientific methods, it becomes more difficult for them. Based on our experience, it would be appropriate for us to explain to students how many lessons are based on easy methods as well as practical experiences. Basically, the methods that help us are the methods of explanation, comparison, example, analogy, mnemonics. We need to improve the way we teach experiments to teach students the elements of a copper group and its compounds.

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