

Physical and Chemical Properties

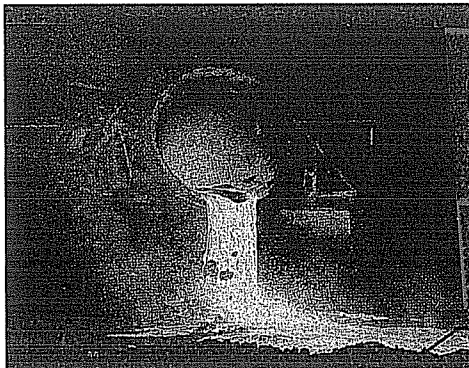
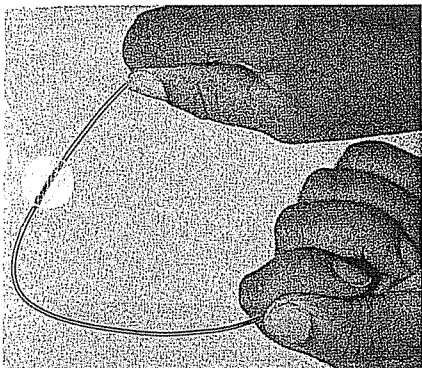


Figure 1 Examples of physical and chemical changes involving copper.

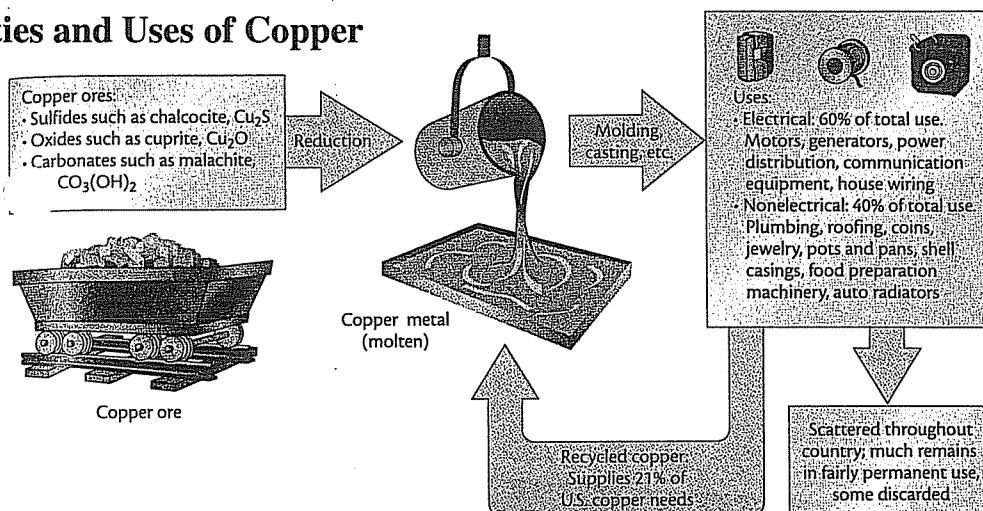
Consider this statement: *Copper compounds are often blue or green.* Does the statement describe a physical or chemical property? To answer the question, first think about whether a change in the identity of a substance is involved. Has the substance been chemically changed? If the answer is no, then the statement describes a physical property; if the answer is yes, then the statement describes a chemical property. Color is a characteristic physical property of many chemical compounds. A green copper compound in a jar on the shelf is not undergoing a change in its identity. Color therefore is a physical property. A **change** in color, however, often indicates that a change in identity and thus a chemical change has occurred. For example, colored matter called litmus, derived from a plant organism called lichen, turns from blue to pink when exposed to an acid. This is a chemical change involving the chemical properties of litmus and acid.

Now consider this statement: *Oxygen gas supports the burning of wood.* Does the statement refer to a physical or chemical property of oxygen? If we apply the same key question – ‘is there a change in the identity of the oxygen gas – you will arrive at the correct answer. The burning of wood (combustion) involves chemical reactions between the wood and oxygen gas that change both substances. The reaction products of ash, carbon dioxide, and water vapor are very different from wood and oxygen gas. This statement refers to a chemical property of oxygen gas.

Classify each statement below as describing either a physical or chemical property. For each chemical change, describe which indicator of a chemical reaction is present.

1. Pure metals have a high luster. (Are shiny and reflect light.)
2. The surfaces of some metals become dull when exposed to air.
3. Nitrogen gas, which is a relatively nonreactive element at room temperature, can form nitrogen oxides at the high temperatures of an operating automobile engine.
4. Milk turns sour if left too long at room temperature.
5. Diamonds are hard enough to be used on drill bits
6. Metals are typically ductile. (Can be drawn into wires.)
7. Bread dough increases in volume if it is allowed to rise before baking.

Properties and Uses of Copper



Some of copper's properties are listed in the table below. Consider how these properties make copper suitable for the uses depicted in the copper cycle shown above. For example, one property that makes copper useful in electrical power generators is its electrical conductivity.

Properties of Copper		
Malleability and Ductility	High	
Electrical Conductivity	High	
Thermal Conductivity	High	
Chemical Reactivity	Relatively low	
Resistance to Corrosion	High	
Useful Alloys Formed	Bronze, Brass, etc	
Color and Luster	Reddish, shiny	

- Determine whether each property listed is a chemical or a physical property. List that information in the blank column in the table.
- Consider the uses of copper listed in the copper cycle above. For each use, identify those particular properties that make copper an appropriate choice.
- For each use listed below, describe a technological change that could decrease the demand for copper:
 - coins
 - power generation
 - communications
 - indoor electrical wiring
- Think of another product used in your home. What physical and chemical properties can you think of that make it useful for its application?