

# Oxidation and Reduction of Copper

## (New Method: 3way cock, Lock Syringe)

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A piece of copper metal is oxidized to black copper oxide by air when heated in a flame. The oxidized copper is reduced when placed in a hydrogen atmosphere. When removed from the hydrogen atmosphere, the metal is again oxidized. The equation for the reaction is included.

### Keywords

applications - practical/real-life, combination reaction, copper, descriptive chemistry, evidence of chemical reaction, hydrogen, oxygen, redox reaction, single exchange/replacement reaction

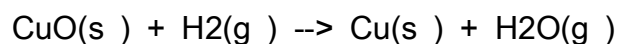
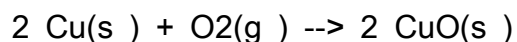
A piece of copper is supported over a burner and is heated. The copper begins to react more rapidly with oxygen from the air and a darker color can be seen on the surface of the copper. This is similar to the color that forms on copper cookware when it is used in a kitchen. A few seconds later the copper has become dark. It has reacted with oxygen in the air. The burner flame is turned out and an inverted funnel with hydrogen gas blowing out of it is placed over the copper. The hydrogen gas is a reducing agent. It reduces the copper oxide on the surface of the copper and causes pure copper to be formed again. The dark color disappears leaving a pure copper color. Oxidation and reduction of the copper can be repeated several times by removing and replacing the funnel until the metal cools and the reactions slow down.

### Discussion

Copper oxidizes slowly in air, corroding to produce a brown or green patina. At higher temperatures the process is much faster and produces mainly black copper oxide. The oxide can be reduced by hydrogen gas, which is a moderately strong reducing agent, producing a shiny, clean copper surface. This provides a striking illustration of oxidation and

reduction of a metal.

Equations for the reactions are



### Exam and Quiz Questions

1. When heated in air, copper changes color. Based on the color change, is the copper being oxidized or reduced?
2. In the presence of hydrogen gas, the copper turns color. Based on the color that the copper turns, is the hydrogen causing oxidation or reduction? Would the hydrogen be classified as an oxidizing agent or a reducing agent?
3. What observable evidence indicates that a reaction is taking place when the copper is being heated? What are the reactants in this reaction?
4. Classify the reactions shown in the video as combination, decomposition, exchange, acid-base, combustion, or redox. (There is more than one reaction, and each reaction may fall within more than one of these categories.)