

# Metals And Their Properties- Physical and Chemical

All the things around us are made of 100 or so elements. These elements were classified by Lavoisier into metals and non-metals by studying their properties. The metals and non-metals differ in their properties.

□ *Main Group*  
**Al, Ga, In, Sn, Tl, Pb, Bi, Po.**

□ *alkali elements*  
**Li, Na, K, Rb, Cs, Fr**

□ *alkaline earth elements*  
**Be, Mg, Ca, Sr, Ba, Ra**

## General Physical Properties of the metals

→ The metals have a shiny appearance, they show a metallic luster. Due to their shiny appearance they can be used in jewellery and decorations. Particularly gold and silver are widely used for jewellery. In the old days, mirrors were made of shiny metals like silver. Silver is a very good reflector. It reflects about 90% of the light falling on it. All modern mirrors contain a thin coating of metals.



→ Metals are mostly harder to cut. Their hardness varies from one metal to another. Some metals like sodium, potassium and magnesium are easy to cut.

→ Metals on being hammered can be beaten into thinner sheets. This property is called Malleability. Most metals are malleable. Gold and Silver metals are the most malleable metals. They can be hammered into very fine sheets. Thin aluminium foils are widely used for safe wrapping of medicines, chocolates and food material.



- ➔ Wires are made from copper, aluminium, iron and magnesium. This property of drawing the metal in to thin wires is called ductility. Most metals are ductile.



- ➔ Electric wires in our homes are made of aluminium and copper. They are good conductor of electricity. Electricity flows most easily through gold, silver, copper and aluminium. Gold and silver are used for fine electrical contacts in computers. Copper wires are used in electrical appliances while aluminium is cheaper is generally used for making electrical cables.



- ➔ Cooking utensils and water boilers are also made of iron, copper and aluminium, because they are good conductors of heat.



- ➔ Metals are generally sonorous. That is they make a ringing sound when struck. Therefore, they are used for making bells. Metal wires are used in musical instruments.



- ➔ Metals such as iron are very strong. Therefore, it is therefore, widely used in the construction of buildings, bridges, railway lines, carriages, vehicles and machinery.



- All metals except Mercury, exist in the solid form at room temperature. Therefore, they retain their shapes under normal conditions.

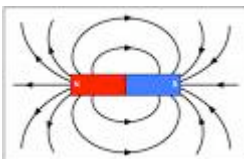


- Metals have high melting points.
- Metals have high tensile strength, that is they can be stretched to some degree without breaking. Metals like tungsten has high tensile strength.



No two metals are absolutely identical. For example,

- Iron is magnetic and copper is not.



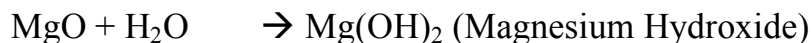
- Gold and Platinum are malleable and ductile but do not react with water.
- Sodium is highly reactive and reacts vigorously with water to form a solution of sodium hydroxide.

### General Chemical Properties

- Metals when burned in the presence of oxygen, they combine with oxygen to form metallic oxides which are basic in nature.

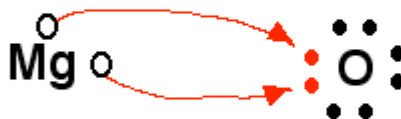
Metal + Oxygen (from air) → Metal Oxide

For example

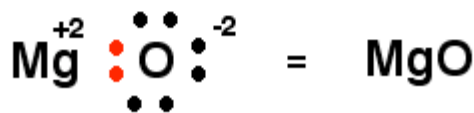


Metal hydroxide changes red litmus blue which shows its basic characteristics.

### Magnesium Oxide

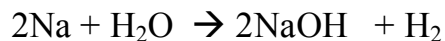


Magnesium loses 2 electrons, and Oxygen gains 2 electrons to have an Octet.

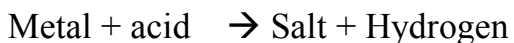


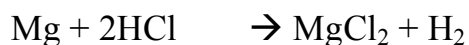
C. Ophardt, c. 2003

→ Different metals react differently with water. Sodium reacts violently with water forming sodium hydroxide and hydrogen. Magnesium reacts mildly with water but vigorously with steam. Zinc and iron react mildly with steam. Copper, gold and silver do not react with water at all. Most metals, on reacting with water produce hydroxide.

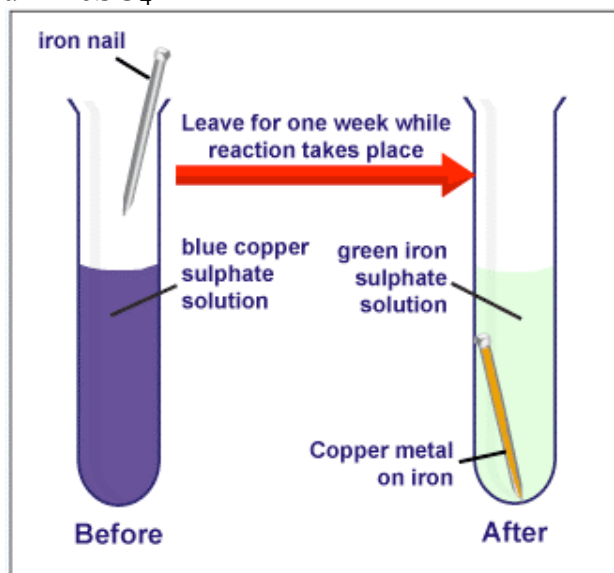
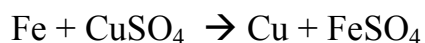


→ Metals differ in their reactivity with acids. Most metals react with acids to produce salts and hydrogen.





➔ Metals replace other metals. When an iron nail is placed in a test tube containing copper sulfate. The nail is coated with a layer of copper while the blue copper sulfate solution has turned greenish. The green solution is a solution of iron sulfate.



➔ Most metals corrode when they are exposed to atmosphere. For example, the iron gets rusty after sometime if it is not painted. Titanium is highly resistant to corrosion.

