

Copper Alloys

Copper alloys are commonly used for their electrical and thermal conductivities, corrosion resistance, ease of fabrication, surface appearance, strength and fatigue resistance.

Copper alloys can be readily soldered and brazed, and a number of copper alloys can be welded by arc, and resistance methods. Color of copper alloys is a significant reason for using them for decorative purposes. For decorative parts, conventional copper alloys having specific colors are readily available.

Copper is used extensively for cables and wires, electrical contacts, and a wide variety of other parts that are required to pass electrical current. Copper alloys are used for automobile radiators, heat exchangers, and home heating systems. Because of copper alloys corrosion resistance they are used for pipes, valves, and fittings in systems carrying potable water, process water, or other aqueous fluids.

Along with ease of fabrication, some of the principal selection criteria for copper alloys are:

- Corrosion resistance
- Electrical conductivity
- Thermal conductivity
- Color and surface appearance

Corrosion resistance of copper alloys is good in many environments, however copper alloys may be attacked by some common reagents and environments. Pure copper resists attack under some corrosive conditions. Some copper alloys, on the other hand, sometimes have inadequate performance in certain environments.

Stress corrosion cracking most commonly occurs in brass. Brasses containing more than 15% Zn are the most susceptible.

Dealloying is another form of corrosion that affects zinc containing copper alloys. During dezincification of brass, selective removal of zinc results in gradual replacement of sound brass by weak, porous copper. Unless stopped the metal is weakened and liquids or gases may be capable of leaking through the porous structure.

Electrical and thermal conductivity of copper and its alloys are relatively good. This is why copper is the most commonly used electrical conductor. Alloying decreases electrical conductivity to a greater extent than thermal conductivity. This is why copper and high-copper alloys are preferred over other copper alloys when high electrical or thermal conductivity is required.

Common classification of copper alloys:

Name	Alloying elements
Coppers	Cu
Brasses	Cu-Zn
Leaded brasses	Cu-Zn-Pb
Tin brasses	Cu-Zn-Sn-Pb
Phosphor bronzes	Cu-Sn-P
Leaded phosphor bronzes	Cu-Sn-Pb-P
Copper-phosphorus and copper-silver-phosphorus alloys	Cu-P-Ag
Aluminum bronzes	Cu-Al-Ni-Fe-Si-Sn
Silicon bronzes	Cu-Si-Sn
Copper-nickels	Cu-Ni-Fe
Nickel silvers	Cu-Ni-Zn