

Alloys:

A metallic product containing two or more metals or sometimes one of the ingredients a non-metal provided that the mixture is homogenous and possesses metallic properties, is known as an alloy. Alloys are usually prepared by melting two or more metals together in the proportions and then allowing the melting to solidify. If one of the metals is mercury the alloy is known as *amalgam*.

Alloys are prepared with a view to impart some desirable properties which the individual metals do not possess. These are,

(1) **Change in the chemical reactivity** : Sodium acts vigorously with water, but *Na-Hg* amalgam reacts slowly to suit the requirement of a number of chemical reactions.

(2) **Hardness** : Silver, gold and soft metals but become hard when alloyed with copper.

(3) **Melting Points** : Melting points of an alloy may be higher or lower than any of its components. Wood-metal, which is an alloy of *Bi*, *Pb*, *Sn* and *Cd* fuses at 60.5°C., while none of these metals fuses at this low temperature.

(4) **Change of colour** : Aluminium bronze is an alloy of aluminium and copper. It is of golden, yellow colour and is used in making decoration articles, jewellery and coins while the colour of aluminium is white and that of copper is red.

(5) **Corrosion resistance** : Iron gets corroded soon whereas stainless Steel, an alloy of iron and chromium, resists corrosion.

(6) **Casting** : An alloy of lead and antimony is known as *type metal* is used for casting type required in printing works.

Alloys of Al

Alloy	Percentage		Important Properties	Uses
Aluminium bronze	<i>Al</i> <i>Cu</i>	95% 5%	Light, strong alloy with golden lustre, resistant to corrosion	Coins, utensils, jewellery picture frames etc.
Magnalium	<i>Al</i> <i>Mg</i>	95% 5%	Light, tough and strong	Light instruments, balance beam, pressure cookers etc.
Duralumin	<i>Al</i> <i>Cu</i> <i>Mg</i> <i>Mn</i>	95% 4% 0.5% 0.5%	Light, tough, ductile, resistant to corrosive action	Making aeroplanes automobile parts pressure cookers etc.

Alloys of Ag

Alloy	Percentage composition	Uses
Coinage silver	Ag = 90, Cu = 10	For making silver coins.

Silver solder	Ag = 63, Cu = 30, Zn = 7	For soldering and joining metals
Dental alloy	Ag = 33, Hg = 52, Sn = 12.5, Cu = 2.0, Zn = 0.5	For filling teeth
Silver palladium	Ag = 40, Pd = 60	Potentiometers and winding of some special instruments.

Alloys of Pb and Sn

Alloy	Percentage Composition	Uses
Solder	Pb = 50, Sn = 50	For soldering.
Pewter	Pb = 20, Sn = 80	In making cups, mugs and other utensils.
Type metal	Pb = 70, Sb = 20 and Sn = 10	For making printing type.
Rose metal	Pb = 22, Sn = 28, Bi = 50	For making electric fuses.
Britannia metals	Sn = 90, Sb = 8, Cu = 2	For making table wares.

Alloys of Copper

Alloy	Percentage Composition	Uses
Brass	Cu = 80, Zn = 20	For making utensils, condenser tubes, wires parts of machinery etc.
Bronze or Copper bronze	Cu = 80, Zn = 10, Sn = 10	For making cooking utensils, statues, coins etc.
Aluminium bronze	Al = 95, Cu = 5	Coins, picture frames, cheap jewellery
Gun metal	Cu = 90, Sn = 10	For making gun barrels.

Bell metal	Cu = 90, Sn = 20	For making bells, gongs etc.
Constantan	Cu = 60, Ni = 40	For electrical apparatus
German silver	Cu = 60, Zn = 20, Ni = 20	For making silver wire, resistance wires etc.
Monel metal	Cu = 30, Ni = 67, Fe and Mn = 3	For making acid pumps and acid containers.
Phosphor bronze	Cu = 95, Sn = 4.8, P = 0.2	For making springs, electrical equipment
Gold-copper alloy	Au = 90, Cu = 10	For making gold coins, jewellery, watch cases, spectacle rims etc.

Alloys of Iron

Name	Percentage	Properties	Uses
Stainless steel	Fe = 73%, Cr = 18%, Ni = 8% and carbon	Resists corrosion	For making utensils, cutlery and ornamental pieces.
Manganese steel	Fe = 86%, Mn = 13% and carbon	Very hard, resistant to wear and tear.	For Making rock drills, safes etc.
Tungsten steel	Fe = 94%, W = 5% and carbon	Retains hardness even at high temperatures	For making high speed cutting tools.
Invar	Fe = 64%, Ni = 36%	Practically no coefficient of expansion.	For making watches, meter scales, pendulum rods etc.
Nickel steel	Fe = 98?96%, Ni = 2?4%	Resistant to corrosion, hard and elastic.	For making wire cables, gears, drive shaft etc.
Permalloy	Fe = 21%, Ni = 78% and carbon	Strongly magnetised by electric current,	For making electromagnets, ocean cable etc.

		loses magnetism when current is cut off.	
Chrome steel	Fe = 98?96%, Cr = 2?4%	High tensile strength	For making axles, ball bearings and cutting tools such as files.
Alnico	Fe = 60%, Al = 12%, Ni = 20%, Co = 8%	Highly magnetic	For making permanent magnets.