

Duraluminium

Composition (%):

Cu	Mn	Mg	Fe	Al
3.5-4.5%	0.4-0.7%	0.4-0.7%	< 0.7%	Rest.

- It has high machinability.
- It is strong as steel but has 1/3rd of its weight.
- So it is used to fabricate parts of aircraft and automobiles.
- It can be heat treated to increase its strength upto 4300 Kg/cm².
- New generation Al - Li alloys are used in aircraft and aerospace industries in cryogenic tank structures.

Hindalium

It is a non-ferrous alloy. It is aluminium based alloy which is made by alloying Mg, Mn and Si. This alloy is strong and hard non reactive with food acids and its cost is lower than stainless steel that why it used for cooking utensils.

Magnalium

This non ferrous alloy made of aluminium (95%) and Mg, Cu, Ni, Mn, Sn. It is a light weight alloy having ductility around 30% and it has good machine ability. Door handles, luggage rack, grinder parts are made of this alloy.

Y-alloy

This alloy consists of Al (92%), Cu, Ni, Mg. Its strength and hardness can be comparable with duralium by doing age hardening on it. It is used in piston, cylinder head, crankcase of scooter, bus and truck etc.

5.6 NICKEL

- It is crystalline, non-ferrous, ferromagnetic metal of silvery-white colour.
- Its hardness matches and compared with the hardness of soft steel but ductility is less than that. The thermal conductivity and electrical conductivity are poor as compared to copper.
- It possesses excellent corrosion resistance against many alkalis and acids. Nickel can be easily joined and hot or cold worked.
- It can be used as anode and cathode.

- Nickel is often used as a cladding on mild steel (niclad), providing both strength and corrosion resistance.
- It is capable of high quality polishing, thereby provides lustre to the products on which it is polished.
- It is reasonably malleable and can also be rolled provided the carbon content is in small amount (upto 0.5% or less)
- It is resistant to acidic attacks, but dissolves readily in nitric acid.

Nickel Alloys**Hastelloy**

- These are Nickel and Molybdenum alloys with Fe, Cr, Cu, Al present in certain proportion.
- These are high strength and high temperature alloys with a very high creep resistance.

Monel Metal

Composition (63% Ni + 30% Cu + Fe + Mn + Si + C). It is not affected by sea water or atmosphere.

- It is highly resistant to the corroding affect of alkalies and acids, hence used in marine application.
- It is used in evaporators (chemical plants), pump impellers for corrosive liquids, pickling plants and drying plants.
- Monel metal filter cloth is used extensively, paints and varnishes are made of Monel metal.

K-Monel Metal

- When (Al) is added to monel metal.
- The utility of K - monel is that it can be made hard by heat treatment retaining corrosive resisting properties of monel metal.
- It is used in valves and seats in pumps, valves and seats of air bottles used in diesel engines.
- Blades used in paper making industry, impulse blades for steam turbines, radio instruments due to its non-magnetic nature.

German Silver

(65% Cu + 25% Zn + 10% Ni). It is very resistant to corrosion, used in rivets, screws, fasteners, nameplates, hollowware etc.

grain boundary (having lower energy). The process of forming this type of sub-grain structure is called polygonization.

- ◀ In a crystalline solid the interatomic spacing, and in some cases the bonding, varies with direction within a single crystal. Young's modulus therefore depends on the direction of the stress in relation to the crystal axes, i.e. single crystals are elastically anisotropic.
- ◀ Although single crystals are elastically anisotropic, a polycrystalline material in which the grains, or crystals, are randomly orientated behaves isotropically, i.e. its properties are the same in every direction. Amorphous materials such as glass and non crystallizing polymers, except when produced in such a way as to cause some alignment of the molecular structure, are also isotropic.

- ◀ When the material properties do not change from point to point in a certain direction the nature is termed as homogeneity.
- ◀ If properties are change from point to point in a certain direction the behaviour is termed as heterogeneity.
- ◀ Metals are isotropic and homogeneous.
- ◀ Composites of most general materials are anisotropic and heterogeneous, while orthotropic materials with controlled anisotropy are homogeneous.
- ◀ **Precipitation hardening, also known as age hardening, is the most important method of strengthening nonferrous alloys such as aluminium and magnesium alloys. Many alloys of copper, iron, nickel, silver and lead are also being strengthened by precipitation hardening. Precipitation hardening of an alloy occurs with time due to precipitation of a coherent phase from a supersaturated solid solution.**