NON FERROUS ALLOYS

Cu- ALLOY BRASS

Name	Composition		Colour	Typical uses
	Cu	Zn		
Muntze metal	59	41	Reddish	Architectural work, welding rod, condenser tubes, valve stems.
Cartridge or spinning brass	70	30	Typical brass colour	Cartridges, tubes, spinning, drawing.
Brazing brass	75	25	Typical brass colour	Drawing, spinning, springs, particularly suitable for brazing.
Red brass	85	15	Red	Hardware, radiator cores, plumbing pipe, condenser tubes, flexible hose.
High brass	66	34	Typical brass colour	Stamping, blanking, drawing, spinning, springs, rivets, chains.
Low brass	80	20	Red gold	Drawing, forming, flexible hose.

Cu-ALLOY BRONZE

II. Bronzes :

These are essentially alloys of *copper and tin.* The effect of composition on physical properties is given below :

- The tensile strength of bronze increases gradually with the amount of tin, reaching a maximum with about 20% of tin, but as the tin increases beyond this amount the tensile strength very rapidly decreases.
- Bronze is *most ductile when it contains about 5% of tin,* with this amount it may be rolled satisfactorily at red heat. Bronze is used chiefly for casting.
- As the amount of tin increases above 5%, the ductility gradually lessens and *practically disappears with about 20% of tin;* since ductility is co-ordinate with toughness, these alloys are very brittle. They are also *very hard.*
- The most useful of bronzes are those that contain from 8 to 11 % of tin, since the maximum combined strength and toughness are secured with about these amounts. Bronze containing tin within these limits *was formerly,* known as **gun metal,** since because of this strength it was

Al- ALLOY DURALUMIN

1. Duralumin :

Composition : Al = 94%, Cu = 4%, Mg, Mn, Si, Fe 0.5% each.

Properties :

(*i*) It can be *cast, forged and stamped.*

(*ii*) It has *high tensile strength.*

(*iii*) It possesses *high electrical conductance.*

(*iv*) It hardens spontaneously when exposed to room temperature.

(*v*) The alloy is soft enough for a workable period after it has been quenched.

(*vi*) The temperature employed for the solution heat treatment of the alloy is the lowest that is applicable to any commercial light alloy.

(*vii*) Specific gravity = 2.8, specific heat = 0.214.

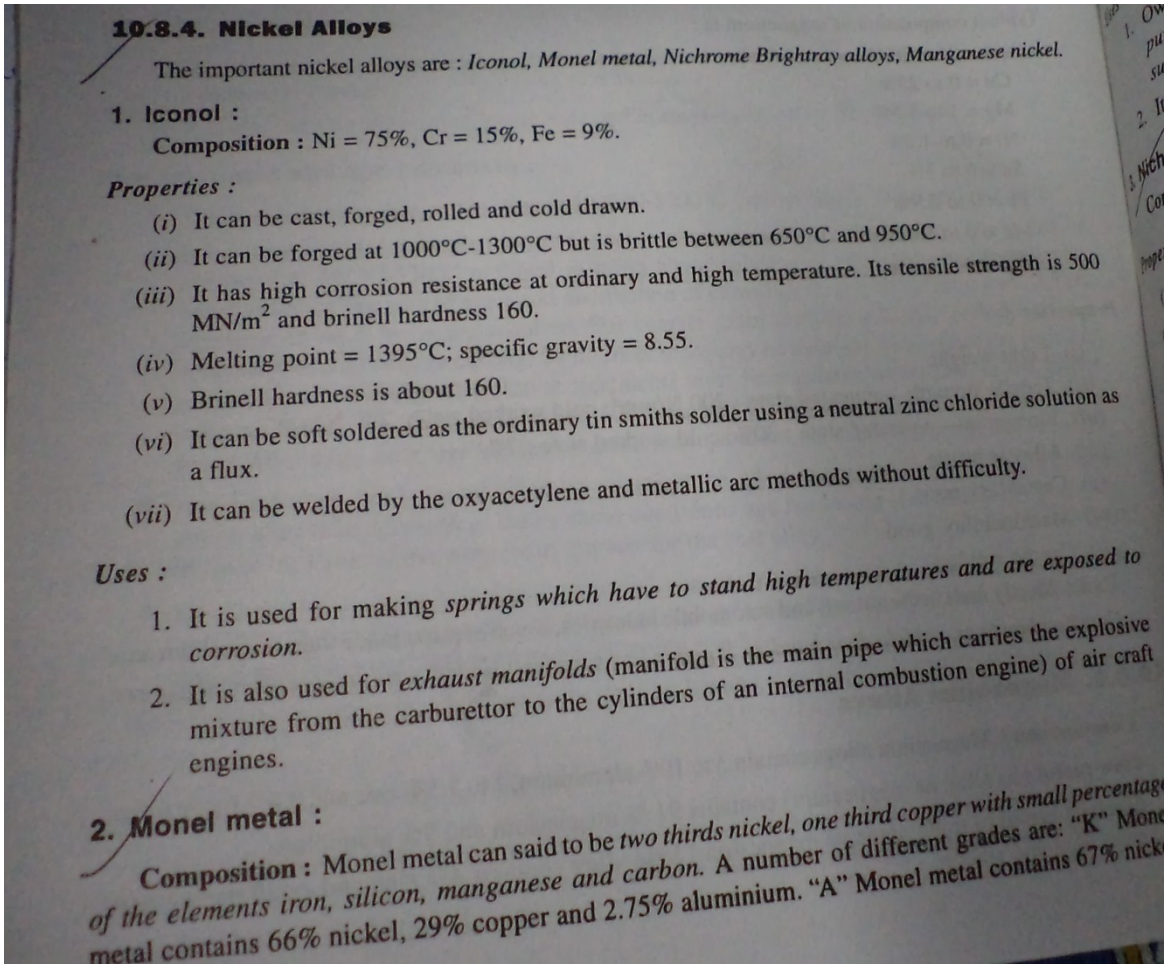
(*viii*) Melting point = 650°C.

(*ix*) Brinell hardness : Annealed = 60, age hardened = 100.

Uses :

1. It is widely used for *sheets, tubes, forgings, rivets, nuts, bolts and similar parts.*
2. Used in making *cables.*
3. It is also extensively used for *air planes and other machines where weight is a deciding factor.*
4. It is also employed in *surgical and orthopaedic* work and for non-magnetic and other instrument parts.

Ni- ALLOY ICONOL, MONEL METAL,NICHROME



10.8.4. Nickel Alloys

The important nickel alloys are : *Iconol, Monel metal, Nichrome Brightray alloys, Manganese nickel.*

1. Iconol :

Composition : Ni = 75%, Cr = 15%, Fe = 9%.

Properties :

(*i*) It can be cast, forged, rolled and cold drawn.

(*ii*) It can be forged at 1000°C-1300°C but is brittle between 650°C and 950°C.

(*iii*) It has high corrosion resistance at ordinary and high temperature. Its tensile strength is 500 MN/m^2 and brinell hardness 160.

(*iv*) Melting point = 1395°C; specific gravity = 8.55.

(*v*) Brinell hardness is about 160.

(*vi*) It can be soft soldered as the ordinary tin smiths solder using a neutral zinc chloride solution as a flux.

(*vii*) It can be welded by the oxyacetylene and metallic arc methods without difficulty.

Uses :

1. It is used for making *springs which have to stand high temperatures and are exposed to corrosion.*
2. It is also used for *exhaust manifolds* (manifold is the main pipe which carries the explosive mixture from the carburettor to the cylinders of an internal combustion engine) of air craft engines.

2. Monel metal :

Composition : Monel metal can said to be *two thirds nickel, one third copper with small percentag of the elements iron, silicon, manganese and carbon.* A number of different grades are: "K" Mon metal contains 66% nickel, 29% copper and 2.75% aluminium. "A" Monel metal contains 67% nick

Ni- ALLOY ICONOL, MONEL METAL,NICHROME

Uses :

1. Owing *to its excellent corrosion resistance properties,* it is widely used for parts of *water-pumps, propellers, domestic water storage tanks and parts subjected to high temperatures, such as internal combustion engines, valve seatings particularly in light alloy cylinder-heads.*
2. It is also used for making *turbine blades and chemical food handling plant.*

3. Nichrome :

Composition : Ni = 60%, Cr = 15% and Fe = 20%

Properties :

(*i*) It is practically non-corrosive.

(*ii*) It can withstand high temperatures without oxidation.

(*iii*) Alloyed with cast iron, it increases resistance of the latter to corrosion and heat as well as to wear.

Uses : *It is used in making electrical resistance wire for electric furnaces and heating elements.*