

# NON FERROUS ALLOYS

# Cu- ALLOY

# BRASS

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

# AI- 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<sup>2</sup> 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 percentage of the elements iron, silicon, manganese and carbon.* A number of different grades are: "K" Monel 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.