Lecture # 2.1b

Engineering Materials

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Non-Ferrous Metals

Metals containing elements other than iron as their chief constituents are usually referred to as non-ferrous metals.

There is a wide variety of non-metals in practice some are discussed below:

Aluminium -

This is the white metal produced from Alumina.

In its pure state it is weak and soft but addition of small amounts of Cu, Mn, Si and Magnesium makes it hard and strong.

It is also corrosion resistant, low weight and non-toxic.

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Duralumin -

This is an alloy of 4% Cu, 0.5% Mn, 0.5% Mg and Aluminium.

It is widely used in automobile and aircraft components.

Y-alloy -

This is an alloy of 4% Cu, 1.5% Mn, 2% Ni, 6% Si, Mg, Fe and the rest is Al.

It gives large strength at high temperature.

It is used for aircraft engine parts such as cylinder heads, piston etc.

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Magnalium -

This is an aluminium alloy with 2 to 10 % Magnesium.

It also contains 1.75% Cu.

Due to its light weight and good strength it is used for aircraft and automobile components.

Copper alloys -

Copper is one of the most widely used non-ferrous metals in industry.

It is soft, malleable and ductile and

It is a good conductor of heat and electricity.

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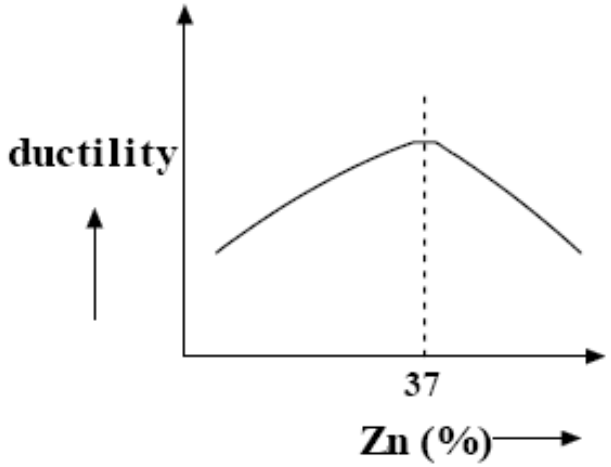
The following two important copper alloys are widely used in practice:

Brass (Cu-Zn alloy) -

It is fundamentally a binary alloy with Zn upto 50% .

As Zn percentage increases, ductility increases upto ~37% of Zn beyond which the ductility falls.



Variation of ductility of brass with percentage of zinc.

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Small amount of other elements viz. lead or tin imparts other properties to brass.

Lead gives good machining quality and tin imparts strength.

Brass is highly corrosion resistant, easily machinable and therefore a good bearing material.

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Bronze (Cu-Sn alloy) -

This is mainly a copper-tin alloy where tin percentage may vary between 5 to 25.

It provides hardness but tin content also oxidizes resulting in brittleness.

Deoxidizers such as Zn may be added.

Gun metal is one such alloy where 2% Zn is added as deoxidizing agent and typical compositions are 88% Cu, 10% Sn, 2% Zn.

This is suitable for working in cold state.

It was originally made for casting guns but used now for boiler fittings, bushes, glands and other such uses.

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