Design & Manufacture

Homework 18

There are two classes of metals:

Ferrous - metals that **contain iron** and are affected by magnetism (apart from stainless steel).

Non-ferrous - metals that **do not contain iron** and are not affected by magnetism.

Metals can also be grouped into:

Pure metals - metals made up from only one chemical element e.g. copper or aluminium.

Alloys - metals made up from a mixture of elements, e.g. copper + zinc (brass) or lead + tin (solder)

Alloying

Metals are alloyed to improve the qualities of the individual pure metals e.g. both copper and tin as pure metals are both soft metals that are easily bent and scratched. When alloyed together (90% copper plus 10% tin) they produce bronze which is hard, rigid and resists scratching. Bronze is used for our 'copper' coins.

Corrosion

When choosing metals, resistance to corrosion may be an important factor.

Corrosion is caused by oxygen in the air combining with the atoms of metal, at the surface of the metal, to create a new chemical called an oxide, e.g. iron oxide is called rust.

In steel the rust layer is loose and can fall away; this exposes new atoms that will combine with oxygen to form new rust.

In non-ferrous metals the oxide layer is dense and does not fall away; this creates a barrier to the oxygen in the air and new corrosion occurs very slowly. The layer is called tarnish.

Properties

Both physical and mechanical properties vary greatly between different metals and alloys and are an important part of the selection process.

Questions

1. What is the difference between ferrous and non-ferrous metals?

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2. What is an alloy and advantages does it have over pure metal?

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3. What is the difference between the corrosion of ferrous and non-ferrous metals?

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