Technical English
Unit 13
professional English
Non-ferrous metals

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Contents

A. **Common non-ferrous engineering metals**

B. **Plating with non-ferrous metals**

A. Common non-ferrous engineering metals

- These website extracts look at the engineering applications of some non-ferrous metals -that is, metals that do not contain iron.

- **Aluminium** is widely used, often in alloy forms. An example is duralumin, an alloy used in aircraft manufacturing, which also contains **copper** (4.4%) and **magnesium** (1.5%). **Aluminium** can also be alloyed with **titanium** to produce very strong, lightweight metals.

A. Common non-ferrous engineering metals

- **Copper** is an excellent electrical conductor, which makes it ideal for use in electric wires. Good ductility also makes it suitable for pipes. Copper is widely used in alloys, notably **brass** (copper and **zinc**) and **bronze** (copper and **tin**, and sometimes **lead**) **.**

- **Silver** is **a precious metal** - a reference to its high cost. It is a better electrical conductor than any other material, so it is often used for electronic connections. Another precious metal - **gold** - is also an excellent conductor, and is highly corrosion-resistant.

A. Common non-ferrous engineering metals

- Notes: For more on metals and alloys, see Unit 11. For more on ductility, see Unit 18.

- The chemical symbol for aluminium =AI, copper= Cu, magnesium = Mg, titanium = Ti, zinc = Zn, tin = Sn, lead = Pb, silver = Ag and gold = Au.

B. Plating with non-ferrous metals

- Non-ferrous metals can be used to protect steel from corrosion by **plating** it- that is, covering it with a thin layer of metal. An example is **galvanizing** (zinc plating).
- Steel can be **hot-dip galvanized**, by placing it in **molten** (liquid) zinc. It can also be **electro-galvanized,** which is a type of **electroplating.** With this technique, the steel component is placed in a liquid (often an acid)- called the **electrolyte** - and connected to the **negative terminal (-)** of an electrical supply, to become the **cathode** (the negative side).

B. Plating with non-ferrous metals

- A piece of zinc is also placed in the electrolyte, and is connected to the **positive terminal** (+) of the supply. This then becomes the **anode** (the positive side). An electric current then flows between the pieces of metal, through the electrolyte. This causes a chemical reaction, which deposits zinc on the cathode, plating the component.
- A related process, called **anodizing**, is used to protect aluminium. The component to be anodized is connected to the positive terminal (to become the anode) and placed in an electrolyte, with a cathode. As electricity flows, **aluminium oxide** is deposited on the anode. As this is harder than aluminium metal, it provides protection.

- **13.1** Make correct sentences using one part from each column. Look at A opposite to help you. The first one has been done for you.

1 Duralumin	can be mixed with copper to make	silver.
2 Titanium	resists corrosion better than the other precious metal,	brass.
3 Zinc	has a high strength-to-weight ratio and is often alloyed with	aluminium.
4 Copper	is an aluminium alloy that also contains copper and	bronze.
5 Gold	can be mixed with tin and lead to produce	magnesmm.

13.1

2 Titanium has a high strength-to-weight ratio and is often alloyed with aluminium.

3 Zinc can be mixed with copper to make brass.

4 Copper can be mixed with tin and lead to produce bronze.

5 Gold resists corrosion better than the other precious metal, silver.

- **13.2** Complete the word groups below using the names of the metals in 13.1 above. You will need to write some names more than once. Look at A opposite to help you.

Metal elements	
Alloys	
Precious metals	

13.2 Metal elements: copper, silver, titanium, zinc, alumjnium, gold, tin, lead, magnesium

Alloys: duralumin, brass, bronze

Precious metals: silver, gold

13.3 Complete the checklist for electroplating using the words in the box. Look at B opposite to help you.

anode	electrolyte	galvanizing	plated
cathode	electroplating	negative	positive

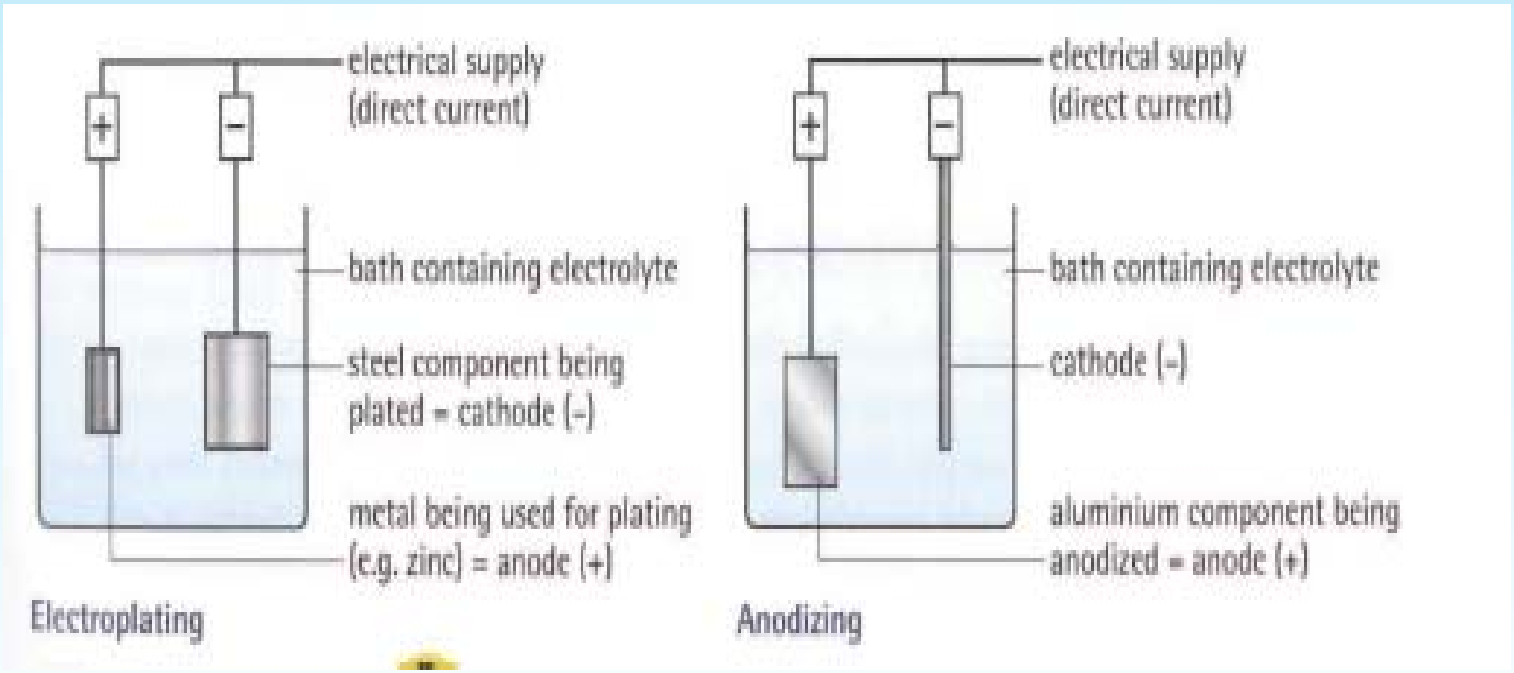
Check that there is sufficient (1) ..... in the bath to completely cover the component, in order to ensure that the component will subsequently be (2) ..... over its entire surface area .

Ensure that the component is connected to the (3) ..... terminal of the electrical supply. During the (4) ..... process, the component should function as the (5) ..... .

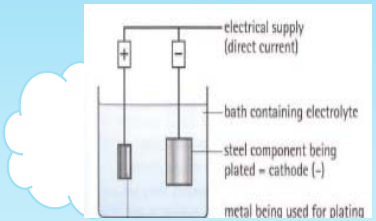
Ensure that the metal being used for plating- e.g. zinc for (6) ..... –is connected to the (7) ..... terminal of the electrical supply. During the process, it should function as the (8) ..... .

13.3

1 electrolyte	3 negative	5 cathode	7 positive
2 plated	4 electroplating	6 galvanizing	8 anode


electrical supply
(direct current)
+
−
bath containing electrolyte
steel component being
plated = cathode (−)
metal being used for plating
(e.g. zinc) = anode (+)
Electroplating
electrical supply
(direct current)
+
−
bath containing electrolyte
cathode (−)
aluminium component being
anodized = anode (+)
Anodizing

Is it clear?



Any Questions