



## ELECTROPLATING (OR) ELECTRO DEPOSITION OF GOLD

Electroplating is the process of depositing the coating metal on the base metal by passing electric current through an electrolytic solution containing the soluble salt of the coating metal. In electrolytic cell, the base metal to be plated acts as cathode where as the coating metal or good electrical conducting inert material acts as an anode.

### Objectives of Electroplating

- i) To increase the corrosion resistances of the base metal.
- ii) To improve the hardness and appearance of the base metal.
- iii) To increase the decorative and commercial values of the article.
- iv) To improve the surface properties of the metals and non metals.
- v) To protect the metal from chemical attack.

### Principle

In electroplating, the anode is made of coating metal and the metal to be coated is taken as cathode. The soluble salt of coating metal is used as electrolyte. When direct current is passed from the battery, coating metal ions move towards the cathode and get deposited. Thus, a thin layer of coating metal is obtained on the article. During the electrolysis, the concentration of electrolyte remains unaltered because the metal ion deposited from the electrolytic solution on the cathode is filled up again (replenished) continuously by the reaction of free anions with the anode.

### Process

The object to be copper plated is treated with organic solvent (CCl<sub>4</sub>, acetone, etc.), followed by dil. HCl or dil. H<sub>2</sub>SO<sub>4</sub>. The cleaned article is then undercoated by Ni and Cr.

Anode: Gold

Cathode: Metal article to be coated (Cu)

Electrolyte: Gold + KCN

Temperature: 60 °C.

Current density (mA cm<sup>-2</sup>): 1-10

When the direct current is passed from the battery through the solution, gold dissolves and moves towards the cathode and gets deposited (**Fig.1.8**). Thus, a thin layer of gold is obtained on the article (at cathode). Sodium thiosulphate or gelatin is used as additives.

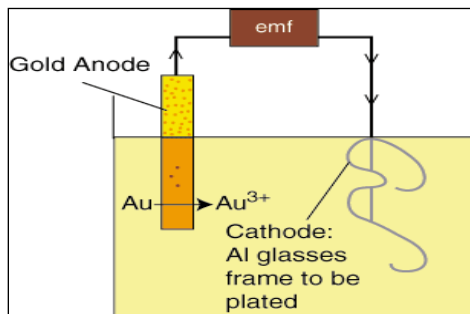


Fig.1.8 Electroplating of gold

### Reactios

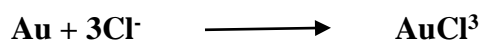
**Ionization:**  $\text{AuCl}_3$  ionizes as



**At Cathode** On passing current,  $\text{Au}^{3+}$  ions move towards the cathode and get deposited on the Cu object



**At Anode** The free  $\text{Cl}^-$  ions move towards the gold anode and dissolve an equivalent amount of Au to form  $\text{AuCl}_3$ .



Thus, there is a continuous formation of electrolyte during electrolysis.

### Characteristics of gold Plating

- i) It gives high quality decorations.
- ii) It provides high oxidation resistant to the metallic objects.
- iii) The thickness of the coating ranges from 0.05 – 0.1 microns.

### Applications

- i) This is used for electrical and electronic applications.
- ii) It is used for high quality decorations and high oxidation resistant coatings
- iii) Usually for ornamental jewels, a very thin gold coating (about  $1 \times 10^{-4}$  cm) is given.