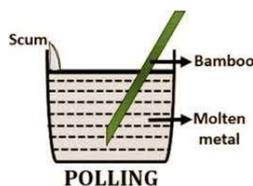


Refining or purification of metals

1. **Distillation:** This method is used for the purification of metals which possess a low boiling point such as mercury, cadmium and zinc. In this process the impure metal is heated in an iron retort above its boiling point so that it can form vapours. The impurities do not vaporize and hence they are separated. The vapours of the pure metal are then condensed and separated in a receiver leaving the impurities behind.
2. **Liquation:** When impurities are less fusible than the metal; impure metal is placed on the sloping hearth of a furnace and heated to melt the metal which flows down leaving the impurities.
3. **Poling:** Oxide impurity of impure metals can be purified by this method. Poles of green wood are used to stir the molten crude metal sample. The hydrocarbon organic matter in the poles acts as a reducing agent and reduces the oxide impurities. This method is used for refining copper.



4. Electrolytic refining

This is one of the most convenient and important method of refining and gives a metal of high purity. This method is applicable to many metals such as **Cu, Ag, Pb, Au, Ni, Sn, Zn etc.** The blocks of impure metal form the anode and thin sheets of pure metal form the cathode. A solution of a salt of the metal is taken as an electrolyte. On passing an electric current through the solution pure metal dissolves from the anode and deposits on cathode. By this process, more metal ions undergo reduction and pure metal is deposited at the cathode. The insoluble impurities either dissolve in the electrolyte or fall at the bottom and collect as **anode mud**. For example, in the refining of copper, impurities like Fe and Zn dissolve in the electrolyte, while Au, Ag and Pt are left behind as anode mud. E.g.

Copper electrolytic refining: During the electrolytic refining of a copper, a thick block of impure copper is made anode, and thin plate of pure copper is made cathode. Copper sulphate solution is used as an electrolyte. On passing electric current, following reactions take place:

Cu^{2+} ions (from copper sulphate solution) go to the cathode (negative electrode), where they are reduced to copper, which gets deposited on the cathode.



Copper (of impure anode) forms copper ions, and these go into solution of electrolyte.



Thus, the net result is transfer of pure copper from anode to the cathode. Impurities like zinc, iron, etc., go into solution; while noble impurities like silver, gold, etc., are left behind as anode mud. Copper is refined to 99.98% pure copper by electrolytic refining.

