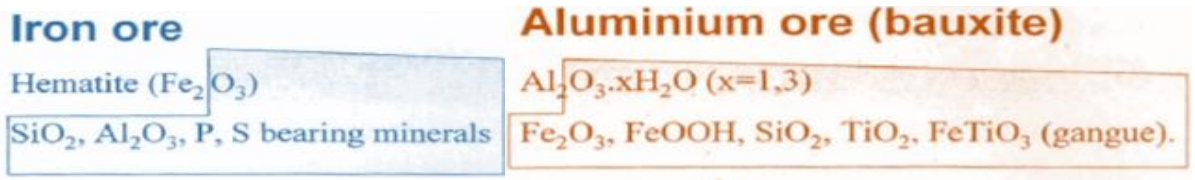
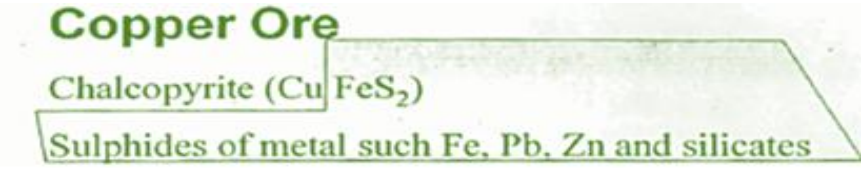
Inorganic Chemical Industries: Extractive Metallurgy

What is Extractive Metallurgy?

- **Native Metals (Can occur as Pure Metals)**
  - Silver-(Ag), Gold-(Au), Bismuth-(Bi), copper-(Cu), iridium-(Ir), Osmium-(Os), Paladium-(Pd), and platinum-(Pt)
- **Carbonate Minerals**
  - $CaCO_3$ (calcite), $CaCO_3 \bullet MgCO_3$ (dolomite), $FeCO_3$ (siderite), $BaCO_3$ (witherite)
- **Halide Minerals**
  - CaF_2 (fluorite), NaCl (halite)
- **Oxide Minerals**
  - $Al_2O_3 \bullet 2H_2O$ (bauxite), Cu_2O (cuprite), Fe_2O_3 (haematite), Fe_3O_4 (magnetite)
- **Sulfide Minerals (Most abundant minerals on the earth's crust)**
  - Cu_2S (chalcocite), $CuFeS_2$ (chalcopyrite), NiS (millerite), $Fe_9Ni_9S_{16}$ (pentlandite), FeS_2 (pyrite)





Example

: A copper ore contains 1.5% Cu. After ore dressing, 4.5 kg of concentrate with 30% Cu is produced from 100 kg of ore. Calculate (a) the concentration ratio (b) the recovery, and (c) the wt. and Cu % content of the discarded gangue (tailings).

Solution:

(a) 4.5 kg of concentrate is obtained from 100 kg of ore. Hence
Concentration ratio = 100 kg/4.5 kg = 22.2

(b) The ore contains a total of 0.015 x 100 = 1.5 kg Cu. The concentrate contains 0.30 x 4.5 = 1.35 kg. Therefore, the **recovery** = 1.35/1.5 x 100 = 90%.

(c) The weight of the tailing (gangue) = 100 - 4.5 = 95.5 kg. The **Cu content in kg** = 1.5 – 1.35 = 0.15 kg. This should give a **Cu percentage** = 0.15/95.5 x 100 = 0.157%