# Silver and its Compounds.

Ores: Argentite (silver glance) $Ag_2S$, Horn silver $(AgCl)$, Ruby silver (Pyrargyrite) $3Ag_2S.Sb_2S_3$.

Extraction: Cyanide process or Mac Arthus-Forrest cyanide process: This method depends on the fact that silver, its sulphide or chloride, forms soluble complex with alkali cyanides in the silver. This implies that silver compounds will dissolve in solution of alkali cyanides in the presence of blast of air.

$$4Ag + 8NaCN + 2H_2O + \underset{\text{air}}{O_2} \rightleftharpoons 4Na[Ag(CN)_2] + 4NaOH$$

or $\quad 4Ag + 8CN^- + 2H_2O + O_2 \rightleftharpoons 4[Ag(CN)_2]^- + 4OH^-$

$$Ag_2S + 4NaCN \rightleftharpoons 2Na[Ag(CN)_2] + Na_2S$$

$$AgCl + 2NaCN \rightleftharpoons Na[Ag(CN)_2] + NaCl.$$

The reaction with the sulphide is reversible and accumulation of $Na_2S$ must be prevented. A free excess of air is continuously passed through the solution which oxidizes $Na_2S$ into sulphate and thiosulphate.

$$2Na_2 + 2O_2 + H_2O \rightarrow Na_2S_2O_3 + 2NaOH$$

$$Na_2S_2O_3 + 2NaOH + 2O_2 \rightarrow 2Na_2SO_4 + H_2O$$

$$2Na[Ag(CN)_2] + 4NaOH + Zn \rightarrow Na_2ZnO_2 + 4NaCN + 2H_2O + 2Ag$$

Compounds of silver : $AgNO_3, Ag_2S, AgCl, AgBr, AgI,$ and $AgO$.