# Tin and Lead.

Tin

Ores of Tin: Cassiterite or tin stone $(SnO_2)$

- The concentrated and roasted ore is reduced with carbon to get impure tin which is purified by liquation process.
- Tin forms two series of salts, i.e., Sn (II) and Sn (IV). Whereas Sn (II) salts are ionic Sn (IV) salts are covalent.
- Tin dissolves in hot conc. NaOH forming $Na_2SnO_3$ and evolving $H_2$ gas.
- Tin reacts with conc. $HNO_3$ forming metastannicacid $(H_2SnO_3)$.
- Tin is not attacked by organic acids and hence is used for tinning of utensils to resist corrosion. Tin foils are used for wrapping cigarettes, confectionary items and for making tooth-paste tubes.
- $SnO_2$ is an amphoteric oxide.
- Stannous chloride $(SnCl_2)$ acts as a good reducing agent. It reduces $HgCl_2$ to first $Hg_2Cl_2$ and then to Hg. It also reduces $FeCl_3$ to $FeCl_2$.
- Stannic chloride $(SnCl_4)$ is a liquid and fumes in air due to hydrolysis. It acts as a Lewis acid and dissolves in concentration HCl forming $H_2SnCl_6$.
- $SnCl_4.5H_2O$ is called butter of tin.
- SnS dissolves in yellow ammonium sulphide.

Lead

Ores of lead: Galena (PbS), Anglesite ($PbSO_4$) and Cerussits $(PbCO_3)$.

- Lead is extracted from galena. The ore is concentrated by froth-floatation process and roasted when a part of the ore is converted into PbO and $PbSO_4$. The unchanged galena then brings about the reduction of PbO or $PbSO_4$ to Pb.
- Lead dissolves in hot conc. NaOH forming sodium plumbite $(Na_2PbO_2)$ and evolving $H_2$ gas.
- Leads forms two series of salts, i.e., Pb (II) and Pb (IV) but Pb (II) compounds are more stable than Pb (IV) compounds. Lead (II) compounds are essentially ionic while lead (IV) compounds are covalent.

- Lead is used in making bullet shots, lead accumulators, tetraethyl lead (antiknocking agent) and a number of pigments such as red lead $(Pb_3O_4)$, white lead or basic lead carbonate $[2\,PbCO_3.Pb(OH)_2]$ and lead chromate $(PbCrO_4)$.
- Litharge is $PbO$. It is obtained by heating $Pb(NO_3)_2$ or $PbCO_3$. It is an amphoteric oxide and is reduced back to Pbby $H_2$, C and CO.
- Red lead $(Pb_3O_4)$ or Sindhur is a mixed oxide $(2PbO.PbO_2)$. It acts as an oxidizing agent and as such oxidizes HCl to $Cl_2$.
- Lead dioxide $(PbO_2)$ is obtained either by treating $Pb_3O_4$ with conc. $HNO_3$ or by treating lead acetate with bleaching powder. It acts as an oxidizing agent and oxidizes HCl to $Cl_2$.
- The ionic character of lead dihalides decreases the order: $PbF_2 > PbCl_2 > PbBr_2 > PbI_2$.
- $PbF_4$ and $PbCl_4$ are stable while $PbBr_4$ and $PbI_4$ are however, unknown. The non-existence of $PbBr_4$ and $PbI_4$ is due to strong oxidizing character of $Pb^{4+}$ ions and reducing character of $Br^-$ and $I^-$ ions.
- $PbF_4$ is ionic while $PbCl_4$ is a volatile liquid.
- Lead is readily corroded by water containing dissolved air forming $Pb(OH)_2$ which has appreciable solubility in water. This action of water on lead called is Plumbosolvency.

$$2Pb + 2H_2O + O_2 \rightarrow 2Pb(OH)_2$$

Whereas organic acids, $NH_4^+$ salts and nitrates increase while salts like carbonates, phosphate and sulphates decrease Plumbosolvency. Hard water, however, has no solvent action on lead.