LEAD

Isotopes	**1st Ionization energy**
^{204}Pb, ^{206}Pb, ^{207}Pb, and ^{208}Pb	715.6 kj/mol
Earth`s crust abundance	**Common oxidation num.**
0.00%	+2, +4
Electron configuration	**Physical state**
$[Xe]4f^{14}5d^{10}6s^26p^2$	solid
Melting point	**Color**
327.5^0C	Bluish white
Boiling point	**Density**
1749^0C	11.34 g/mL

Introduction

- Group IVA is called Carbon Family, C, Si, Ge, Sn, and Pb.
- Lead comes from the Latin word "plumbus', which means heavy,
- Shows metallic properties
- Grey colored, shiny, soft metal
- Can be cut easily.
- Malleable but not ductile.
- Lead and lead compounds are poisonous
- Heavy metals are deposited easily in the body.
- Lead prevents enzymes from catalyzing some important reactions.

1. Occurrence

- It is found in its minerals in trace amounts.
- Gelena, PbS, Cerussite, $PbCO_3$, Anglesite, $PbSO_4$ are main lead minerals.
- In the preparation of lead, gelena is roasted in blast furnace.
  $2PbS(s) + 3O_2 \rightarrow 2PbO(s) + 2SO_2$
  $PbS(s) + 2O_2 \rightarrow PbSO_4$
  $PbS(s) + 2PbO(s) \rightarrow 3Pb(l) + SO_2$
  $PbS(s) + PbSO_4(s) \rightarrow 2Pb(l) + 2SO_2$

2. Chemical Properties

- An amphoteric metal.
- Reacts with chalcogens, halogens,
- Reacts with strong bases and some acids.
- Pb^{2+} ion has a poisonous effect.
- Pb forms its halides with halogens .
  $Pb(s) + F_2 \rightarrow PbF_2$
- Lead powder reacts with oxygen .
  $2Pb + O_2 \rightarrow 2PbO$(yellow)
  If O_2 is excess, Pb_3O_4(red lead) occurs.
- When O_2 and CO_2 are dissolved in water passing through lead pipes, white $Pb(OH)_2$ and $PbCO_3$ solids occur.
- Reacts with sulfur to form lead sulfide.
  $Pb(s) + S(s) \rightarrow PbS(s)$ (black)
- $3Pb + 8HNO_3(dil.) \rightarrow 3Pb(NO_3)_2 + 2NO + 4H_2O$
  $Pb + 2H_2SO_4(conc.) \rightarrow PbSO_4 + SO_2 + 2H_2O$
- Reacts with conc. strong basic solutions.
  $Pb + 2NaOH(conc.) + 2H_2O \rightarrow Na_2[Pb(OH)_4] + H_2$

3. Compounds

Lead (II) Oxide, PbO

- Obtained by the oxidation of Pb at high temperature.
  $2Pb(s) + O_2(g) \rightarrow 2PbO(s)$

Lead (IV) Oxide, PbO_2

- Obtained by the oxidation of Pb^{2+} in PbO.
  $PbO(s) + ClO^- \rightarrow PbO_2 + Cl^-(aq)$

Lead (II, IV) Oxide, Pb_3O_4

- Formed by heating solid PbO in air to 450°C.
  $6PbO(s) + O_2 \rightarrow 2Pb_3O_4$
- If Pb_3O_4 is heated into 550°C, PbO and O_2 form.
  $2Pb_3O_4 \rightarrow 6PbO(s) + O_2$

Lead (II) Sulfide, PbS

- Obtained by precipitating Pb^{2+} ions from solution with H_2S,Na_2S or $(NH_4)_2S$.
  $Pb^{2+} + H_2S \rightarrow PbS(s) + H_2$

Lead (II) Nitrate, $PbNO_3$

- It is the only soluble salt of lead
- Obtained by the reaction of Pb_3O_4 with HNO_3.

Uses

- Computer sends electronic data by means of lead alloy solders.
- Lead glazes protects electronic microcircuits from atmospheric corrosion.
- Alloys of lead in fuses and in automatic fire extinguishers.
- Tetraethyl lead in motor fuel.