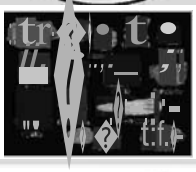
METALLURGY

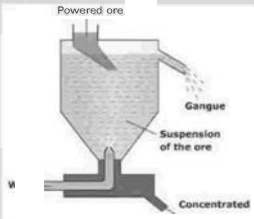
Mineral
Natural Substances in which metals or their compounds occur e.g. Bauxite, Haematite etc.



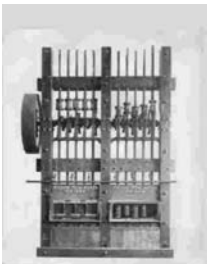
Gangue
Impurities associated with minerals are collectively known as gangue or matrix.

Ore
Mineral from which the metal can be conveniently and profitably extracted

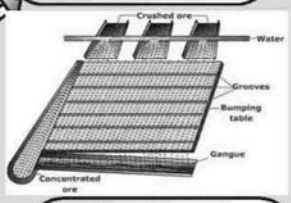
Crushiing by gyratory crusher
Conversion of big rocks (ore) into reasonable size particles



Crushiing & Grinding



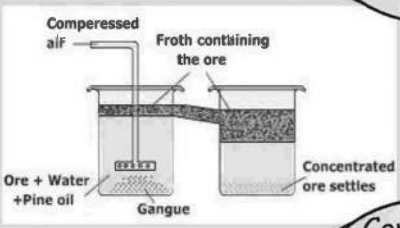
Grinding or Pulverisation by stamp mill or ball mill
Crust ore particles are reduced to fine powder



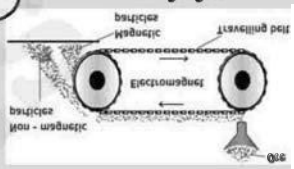
Hydraulic washing or gravity separation
Used for ores of iron, tin & Lead
This methods is based upon the difference in the densities of ore particles and impurites (gaunge)

Concentration of ore

Froth floatation
Used for sulphide ores such as galena (PbS), HgS etc.
This methods is based on the principle on difference in the wetting properties of the ore and gangue particles with oil and water respectively



Magnetic separation
Used for ore of iron such as haematite (Fe_2O_3)
This method depends upon the difference in the magnetic properties of ore and gangue



Conversion of ore into metal oxide

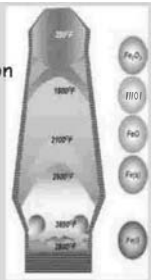
Calcination
Heating of concentrated ore in absence of oxygen
Used for carbonate, oxide and hydrated ores e.g. calamine ($ZnCO_3$), Siderite ($FeCO_3$)

Roasting
Heating of concentrated ore in presence of air(Oxygen)
Used for sulphide ores e.g. galena (PbS), Cinnabar (HgS)etc.

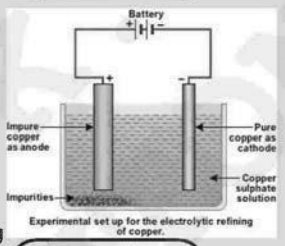
Conversion of metal oxide into metal

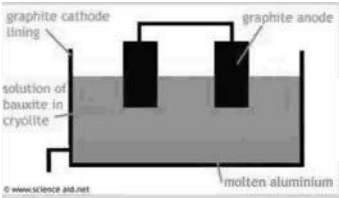
Reduction by heating
Used for ores of low reactive metals e.g. HgS

Chemical reduction
Used for ores of moderately reactive metals e.g. Fe_2O_3 , MnO_2 etc.
- Reduction by carbon
- Reduction by carbon monoxide
- Reduction by aluminium



Electrolytic reduction
Used for carbonate, oxide and hydrated ores e.g. calamine ($ZnCO_3$), Siderite ($FeCO_3$)



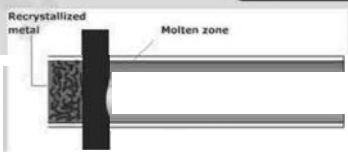


Refining of metal

Electrolytic refining
It is used for refining of many metals such as Cu, Sn, Ni, Ag etc.

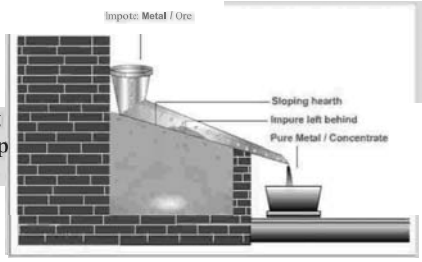
Distillation
It is used for the purification of volatile metals such as Hg, Zn etc.

Zone refining
It is used for refining of Si, Ge etc.



Van arkel method
It is used for refining of Ti, Zr etc.

Liquation
It is used for refining of metals having low m.p such as Sn, Pb, Bi etc.



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Class-X(Chemistry)

BONDING IN CARBON & ALLOTROPY

Covalent bonding

Types of covalent bond

- Single covalent bond — Example: H_2, C_2H_6 (H–H) (H–C – CH_3)
- Double bond — Example: O_2, C_2H_4 (O=O) ($H_2C = CH_2$)
- Triple bond — Example: N_2, C_2H_2 ($N \equiv N$) ($HC \equiv CH$)

Characteristics

- Exhibit both Crystalline and non-crystalline structure
- Physical state may be solid liquid or gas
- Low m.p.& b.p.
- Consist of molecules
- Generally Soluble in non-polar solvent like benzene, CCl_4 etc.
- Bad conductor of electricity

Representation

- H_2 molecule — H–H; Shared electron pair
- Cl_2 molecule — Cl–Cl; Shared electron pair
- O_2 molecule — O=O; Shared electron pair
- H_2O molecule — 2 Shared electron pairs
- CH_4 molecule — 4 Shared electron pairs

Allotropes of carbon

Crystalline

Diamond

- Structure
  - Tetrahedral structure
  - Every C-atom attach with 4 another carbon atom by covalent bond
- Properties
  - Transparent & colourless
  - Refractive index= 2.45
  - Specific gravity= 3.51
  - Bad conductor of electricity
  - Good conductor of heat
- Uses
  - Used as a jem in jewellery
  - Used for glass cutting
  - Used as die for drawing wires from metal
  - Used in making drill
  - Used in high precision thermometre & protective windows for space probes

Graphite

- Structure
  - Layers with hexagonal rings present
  - Each C-atom attach with another 3 C-atom with covalent bond
  - Each C-atom has single free electron
  - Two adjacent layers attach with weak vander wools forces
- Properties
  - Grey in colour & opaque
  - Specific gravity = 2.26
  - Specific gravity = 2.26
  - Soft and has a soapy touch
  - High m.p & good conductor of electricity
- Uses
  - Used as dry lubricant
  - Used in making crucible
  - Used as neutron moderator in nuclear reactor
  - Used in steel, retorts & brake lining

Fullerene

- Structure: Fullerene (C_{60}) shape is like a soccer ball with 20 hexagonal ring and 12 pentagonal rings
- It is also known as bucky ball
- Uses
  - Act as insulator, semiconductor and super conductor under suitable condition
  - Catalyse the photo-chemical refining in industry.

Amorphous

- Lamp black
- Coke
- Charcoal

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