GBN GOVT. POLYTECHNIC NILOKHERI

SUBJECT: CHEMISTRY

BY: CHEMISTRY FACULTIES

Metallurgy

Metallurgy is a branch of science which deals with the extraction of metals from their ores and their purification.

Types of metallurgy

- There are three types of metallurgy:
- Pyrometallurgy: In this type of metallurgy, metal is extracted from its ore by heating it upto high temperature.
- Electro-metallurgy: In this type of metallurgy, the metal is extracted from its ore by passing electric current through molten form or solution of the ore.

- Hydrometallurgy: In this type of metallurgy, the powdered ore is mixed with a solvent and filtered to remove the impurities. The ore is then precipitated by adding a suitable solvent into the mixture.

Metallurgy of Iron

- Important ores of iron are:
- Haematite Fe_2O_3
- Magnetite Fe_3O_4

Process:

- Crushing and grinding
- Concentration of the ore

1. Gravity separation method
2. Electro separation method
3. Froth flotation process

- Conversion of ore into oxide

1. Roasting
2. Calcination

- Smelting

Metallurgy of copper

Important ores of copper are:

- Copper pyrites $CuFeS_2$
- Copper glance Cu_2S

Process :

- Crushing and grinding
- Concentration of the ore

1. Gravity separation method
2. Froth flotation process

- Roasting
- Smelting
- Bessemerisation
- Refining of copper

Metallurgy of aluminium

Important ores of aluminium are:

- Bauxite $Al_2O_3 2H_2O$
- Cryolite Na_3AlF_6

Extraction of aluminium from bauxite ore

- Purification of bauxite to get alumina

1.Hall's process

2.Bayer's process

3.Serpeck's process

- Electrolysis of alumina to get aluminium
- Purification of aluminium

Corrosion

Corrosion is defined as a chemical process in which metal is destructed from its surface due to action of surroundings.

Types of corrosion

- It is of two types
- Dry or chemical corrosion:This type of corrosion result when the metal is exposed in air.
- Wet or electro-chemical corrosion:It result when the metal is dipped in liquid whether it is partially or fully dipped.

Factors affecting corrosion

- Nature of metal
- Nature of solvent
- Presence of gases in atmosphere
- Moisture
- Conductance of the corroding medium
- Temperature:Higher the temperature, Higher the corrosion.

Effects of corrosion

- Loss of useful properties of metal and thus loss of efficiency.
- Increase in maintenance and production cost.
- Contamination of product.

Theories of corrosion

There are two theories:

- Direct chemical action theory
- Electro-chemical theory

Prevention of corrosion

1. Cathodic protection: It has two types
- Sacrificial anodic protection method
- Impressed current cathodic protection
2. Cementation
3. Using pure metal

Fuel

Any combustible substance which produces a large amount of heat on complete burning that can be used for some domestic or industrial purpose economically and profitably.

For eg. Coal, petroleum, wood,etc.

Criteria for selection of fuel

- It should posses a high calorific value.
- It should be cheap and readily available.
- The velocity of combustion should be moderate.
- It should have low moisture content.
- It should be safe, convenient and economical for storage and transportation.

Classification of fuel

- Depending upon physical state fuels can be classified into three types:
- Solid
- Liquid
- Gaseous

Calorific value

It is the amount of heat produced when a unit mass of fuel is burnt completely.

Its unit is cal/g or kcal/kg.

It is of two types:

- High calorific value (HCV)
- Low calorific value (LCV)

- High calorific value: It is the amount of heat produced when a unit mass of fuel is burnt completely and the product of combustion are allowed to cool down to room temperature.
- Low calorific value: It is the amount of heat produced when a unit mass of fuel is burnt completely and the product of combustion are allowed to escape into the atmosphere.

LCV=HCV-Latent heat of water vapour formed

Water gas

- Composition: CO=40% , H_2=50% , CO_2 =5%, N_2=5%
- Calorific value: 2800 kcal/m
- Uses: 1. It is used for obtaining hydrogen on a commercial scale.

2. It is used for welding purpose.

3. It is used for manufacturing methyl alcohol.

Producer gas

- Composition: CO=35%, N_2=65%, along with the traces of H_2, CO_2, methane and other hydrocarbon.
- Calorific value: 1300kcal/m (lowest).
- Uses: 1. It is used as a heating fuel for certain furnaces.

2. In manufacture of coal gas. It is used for heating incinerators.

3. It is used to provide reducing atmosphere in certain metallurgical operations.

Octane number (Petrol)

- The quality of petrol is expressed by octane numbers.
- Higher the octane number of petrol, better is the quality of petrol.
- The octane number of petrol is increased by adding antiknock compounds like tertraethyl lead (C_2H_5) Pb.

Cetane number (Diesel)

- The quality of diesel is expressed by cetane number.
- Higher the cetane number of diesel, better is the quality of diesel.
- The cetane number of diesel is increased by adding antiknock compounds like acetone, nitrate etc.

Knocking

The irregular combustion of fuel which produces noise and jerks is called knocking.