Rusting of Iron and Crystallization

Rusting of Iron

Observation of Rusting

Riya and Kabir observed a rusty bicycle and questioned how iron turns into rust.

Rusting is not just a change in color but a chemical reaction that leads to the formation of a new substance.

Rust has different properties compared to iron, making it an entirely new compound.

What is Rusting?

- Rusting is a slow chemical reaction where iron reacts with oxygen and water to form rust.
- The process is scientifically known as oxidation.
- Equation for Rust Formation: Iron (Fe)+Oxygen (O_2 from air) + Water (H_2O) $\rightarrow$ Iron Oxide (Fe_2O_3, Rust)

Conditions Necessary for Rusting

Presence of Oxygen and Water: Both must be present for rusting to occur.

Humidity Speeds Up Rusting: Higher moisture content in the air increases the rate of rusting.

Salt Water Increases Rusting:

- Rusting occurs faster in salty environments.

  Example: Parts of ships submerged in seawater rust more quickly than other parts, even with regular painting.

Prevention of Rusting

Prevent Contact with Oxygen and Water:

- Keep iron objects away from moisture and air exposure.

Applying Protective Coatings:

- **Paint, Oil, or Grease:** Forms a barrier against air and moisture.
- Regular Application Needed to maintain protection.

Galvanization

Coating iron with a layer of zinc to prevent rusting.

Example: Galvanized iron pipes used in homes for water supply.

Chromium and other metals can be used to cover iron surfaces.

Conditions Necessary for Rusting

Ships are mostly made of iron and are in constant contact with water and humid air.

Sea water contains salts, which accelerate rusting.

Even the parts above water are affected due to water droplets sticking to the surface.

Despite regular painting, ships suffer damage due to rust and require frequent repairs.

Crystallization

What is Crystallization?

Crystallization is a process of obtaining pure crystals from an impure solution.

Example:

Pure salt crystals can be obtained from seawater using the crystallization method.

Crystallization

Materials Required

- Beaker
- Water
- Dilute sulphuric acid
- Copper sulphate powder
- Stirring rod
- Heat source

Procedure

i. Take a cup full of water in a beaker.

ii. Add a few drops of dilute sulphuric acid to the water.

iii. Heat the water until it starts boiling.

iv. Slowly add copper sulphate powder while stirring continuously.

v. Keep adding copper sulphate powder until no more dissolves.

vi. Filter the solution to remove impurities.

vii. Allow the solution to cool without disturbing it.

viii. After some time, observe the formation of copper sulphate crystals.

ix. If no crystals appear immediately, wait for a longer duration.

Significance of Crystallization

Helps in purification of substances.

Commonly used in industries to obtain pure substances from impure solutions.

Crystallization

Concept	Explanation
Rusting of Iron	Chemical reaction where iron reacts with oxygen and water to form rust (iron oxide).
Conditions for Rusting	Requires both oxygen and water; faster in humid or salty environments.
Prevention of Rusting	Paint, grease, galvanization (zinc coating), and chromium coating.
Crystallization	Process of obtaining pure crystals from an impure solution.
Example of Crystallization	Copper sulphate crystals from a saturated solution.