Applied chemistry 22211

List of Chapters

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Water treatment & Analysis

4.1-Hardness & types,Determination of hardness by soap & EDTA method

4.2 Effect of hard water in boilers and prevention. Boiler corrosion,caustic embrittlement,, priming and foaming, scales and sludges.

4.3 Water Softening methods-Lime soda ,Zeolite,Ion exchange.Water softening: Lime soda process (hot lime soda and cold lime soda process), zeolite process, ion exchange process (cation exchange and anion exchange).

4.4 Municipal water treatment process-Sedimentation ,Coagulation ,Filtration and Sterilization
4.5 Wastewater Characteristics- BOD & COD ,sewage treatment ,recycling of waste water
4.6 Desalination of water- Reverse Osm

Sources of water - River, Lake ,Pond,Underground water.
Rainwater is the Purest form of Water.
Sea water is brackish water i.e salty water.
Characteristic:

- water is colourless, odorless and tasteless .
- pH of water - 6.5 to 8.5 (for normal drinking water.)
- Hardness - the concentration of calcium and magnesium ion in water in terms of Equivalent of Calcium carbonate
- Hardness maximum limit is 500 ppm, (acceptable limit = 200 ppm)
- Total dissolved solids (TDS)- 500mg/L
- Turbidity of water less than 1 for drinking water and below 5 NTU in water.(Nephelometer is used to measure turbidity.)
- Dissolved oxygen -4.7 mg/L in Normal water
- Chlorides - less than 250ppm.
- Fluorides- 1.5ppm.
- Nitrates 45 gm /L(excess nitrate in water causes blue baby syndrome).

Types of water : hard water and soft water

Hardness of water

- Hardness Prevent lathering of soap.
- Hardness in water is due to Calcium and Magnesium ions in water.

Types of Hardness

- **Temporary hardness** - due to bicarbonate & carbonate of Ca^{2+} and Mg^{2+} also called as carbonate hardness
  1. Also called as carbonate or Alkaline handness
  2. It can be removed by boiling.
- **Permanent Hardness** - due to chloride & sulphate ions of Ca^{2+} and Mg^{2+} also called as non-carbonate hardness
  1. Also called Non-carbonate or Non Alkaline Hardness.
  2. It cannot be removed by boiling.
  3. It can be removed by chemical methods.

Calculation of degree of hardness

Calculation of Degree of Hardness (in terms of equivalents of CaCO3)

[Hardness of water - Determination per*fo*rmed in Experiment).

Calcium ion forms a complex chelate with EDTA

Unit of hardness

- ppm (parts per million)
- mg/L. (also 1ppm = 1mg/L)
- Degree Clarke (Cl).
- Degree French (Fr)