30/4/21

Class ⇒ B.Sc. (Hons.) Part – II
Subject ⇒ Chemistry
Paper ⇒ III A
Chapter ⇒ Colloids
Topic ⇒ origin of charge

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Origin of charge on Colloidal Particles

All the dispersed particles of a particular colloidal particles carry a positive or a negative charge. They acquire this charge by
(1) Adsorption of ions from the aqueous medium
(2) Ionisation of surface groups.

(1) By Adsorption of ions

The charge on the colloidal particles originates by the selective adsorption of ions common to the particles from the dispersion medium.

e.g. (i) Ferric hydroxide colloidal particles are positive because they adsorb the common ion Fe^{3+} from the aqueous medium.

$$Fe(OH)_3 + Fe^{3+} \longrightarrow Fe(OH)_3/Fe^{3+}$$

Ferric hydroxide — Positive ferric hydroxide colloidal particle.

(ii) Arsenic Sulphide colloidal particle acquire a negative charge because they adsorb the common ion S^{2-} from the medium.

$$As_2S_3 + S^{2-} \longrightarrow As_2S_3/S^{2-}$$

Arsenic sulphide — Negative Arsenic sulphide colloidal particle.

(iii) Colloidal particles may adsorb the anions or cations whichever are in excess and acquire the corresponding charge.

e.g. The AgCl particles can adsorb Cl^- ions from chloride solution and Ag^+ ions from solution containing Ag^+ ions. The colloidal particles becomes negatively charged in the first case and positively charged in the second case.

(2) Ionization of surface groups

(i) Charge on Soaps and Detergent Sols ⇒ Soaps and detergents sol particles are aggregates of many molecules.

The hydrocarbons tails of the molecules are directed to the centre, while the groups $-COO^-Na^+$ (or $-OSO_3^-Na^+$) constitute the surface in contact with water. As a result of ionization of the surface groups, the particle surface is now made of the anionic heads $-COO^-$ (or $-OSO_3^-$). This makes the colloidal particles negative.

(ii) Charge on Protein Sols ⇒ Protein sol particles possess both acidic and basic functional groups. In aqueous solution at low pH, the $-NH_2$ group (basic) acquires a proton to give $-NH_3^+$, while at high pH the $-COOH$ group (acidic) transfers a proton to OH^- to give $-COO^-$. Thus the protein sol particles has positive charge at low pH and negative charge at high pH. At an intermediate pH called the isoelectric point, the particles are electrically neutral.

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