Coagulation : or precipitation or Flocculation :→

In Colloidal solution, Colloidal sol contain one type of charge only which may be positive or negative. When small amount of an electrolyte (suitable) is added to Colloidal solution the particle of sol (which is already charged) attract the oppositely charged ion from the electrolyte and thus get neutralised. the ion ~~which~~ of electrolyte which is responsible to neutralise the Colloid sol (which is already charged) is called coagulating ion or flocculating ion. After neutralisation the neutral particle starts accumulation to form particles of larger size which are settle down.

The process of aggregation of Colloidal particles (which is neutralised) in such a way by which it form large size particle which ultimately settle down as a precipitate is called Coagulation or flocculation or precipitation.

The small amount of electrolyte which is added in Colloidal solution to make the Colloidal particle neutralised, if the concentration of electrolyte is low then the process is called flocculation & if the concentration of electrolyte

is high then it is called Coagulation.

The minimum amount of electrolyte in millimoles which on addition to one litre of colloidal solution by which complete coagulation is created is called Coagulation or precipitation or flocculation value of electrolyte. During coagulation if low amount of electrolyte is required to coagulate the colloidal sol it mean higher is the coagulating or precipitating power of electrolyte, which was explained by Hardy & Schulze.

Hardy & Schulze law :→

Coagulation effect and coagulation power of electrolyte for a particular colloidal sol was studied by Hardy & Schulze, and the experimental evidence obtained by Hardy & Schulze is called Hardy Schulze law. According to this law.

1. Only one type (by charge) of ion of electrolyte having opposite charge than colloidal sol is responsible for coagulation, this ion is called Coagulating ions.

11. Greater is the valency of flocculating or coagulating ion greater is it's power to bring about coagulation or flocculation.

Eg 1) A negatively charged sol As_2S_3 is taken and NaCl, $MgCl_2$ & $AlCl_3$ are added separately in a container to make it coagulate. It was observed least amount of $AlCl_3$ was required to coagulate it means the coagulating power of $AlCl_3$ is more than $MgCl_2$ & NaCl, this is because of the higher valency of Al (3) than Magnesium (2) & Sodium (1). Hence the salt having higher valency is better coagulating agent for negatively charged fix amount of colloids.

Hence coagulating power is $Al^{3+} > Mg^{2+} > Na^{+}$ (for As_2S_3 (a negatively charged colloid).

Note for a positively charged colloid coagulating value of all three NaCl, $MgCl_2$, & $AlCl_3$ will be same because the -ve ion is Cl^- which same for all coagulating compounds.

2) A positively charged sol $Fe(OH)_3$.

Fixed amount of $Fe(OH)_3$ soln is taken as colloid in a container & KBr, KNO3, K_2SO_4, K_3PO_4, & $K_4[Fe(CN)_6]$ are added in small quantity separately in different container using same colloid $Fe(OH)_3$ in same quantity. For the above experiment the coagulating ion is Br^-, NO_3^-, SO_4^{2-}, PO_4^{3-}, $[Fe(CN)_6]^{4-}$.

Coagulating Power: $[Fe(CN)_6]^{4-} > PO_4^{3-} > SO_4^{2-} > NO_3^- = Br^-$

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Hofi: For a negative Colloid or Sol the Coagulating power of all KBr, KNO3 K_2SO_4, K_3PO_4, $K_4[Fe(CN)_6]$ will be same because K^+ will be Coagulating ion for all, and valency is only one for Potassium.

If the coagulating ions have same valency then it depends on the size of coagulating ion.

i.e $I^- > Br^- > Cl^- > F^-$

Gold no:→

At first we take lyophilic and lyophobic both type of Colloids in different two test tube, and we will add a very small quantity of suitable electrolyte in both test tube we observe lyophilic Colloid which is more Stable could not give precepitate, but lyophobic Colloid which was less Stable gave precipitate, Now we mix up the lyophilic Colloid in lyophobic Colloid and again mix up suitable electrolyte now we observe lyophobic Colloid can not produce precipitate, it means lyophilic Colloid has given protection to lyophobic Colloids, and this protection power of lyophilic Colloid to lyophobic Colloid is called gold no.

Hence we can say: It is actually the calculation of protective Colloid in milligrams to be added to 10 ml of gold sol to prevent its Coagulation on addition of 1 ml of 10% NaCl solution is called Gold no.

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Peptization: →

The process in which freshly prepared precipitate converts into colloidal particles after shaking with peptizing agent in dispersion medium is called peptization. Peptizing agents are actually suitable electrolyte which converts precipitate into colloids.

for example: (1) there is a precipitate of Silver Chloride (White ppt) in aqueous midium. If we mix up small amount of $AgNO_3$ or HCl in it then the precipitate converts into colloidal solution, which is a kind of peptization.

(2) At first we take freshly prepared ferric hydroxide as precipitate and then we add some amount of ferric Chloride ($FeCl_3$) as a peptizing agent in it then precipitate converts into Colloid which is a kind of peptization.

Cause of Peptization: → When we mix up a very small quantity of peptizing agent in freshly prepared precipitate having a common ion, then common ion is adsorbed by the precipitate and show a particular same type of charge.

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