Compare the Precipitation Values Of Sodium Chloride, Barium Chloride & Aluminium Chloride For Arsenious Sulphide sol

Theory

Arsenious sulphide sol consists of colloidal particles of arsenious sulphide, As_2S_3, dispersed in water. It is a negatively charged sol. It will be precipitated by positively charged ions.

However, the precipitation value of the cation will depend upon the valency of the cation. Thus univalent cations such as sodium ion (Na^+) have much less precipitation power and, therefore, in their case large amount of salt will have to be added to precipitate the arsenious sulphide sol. On the other hand, bivalent cations such as barium ions (Ba^{2+}) have much greater precipitation power and a lesser amount of such salts will be needed for precipitating the arsenious sulphide sol. The trivalent cations such as aluminium ions (Al^{3+}) have still greater precipitation power and still lesser amount of aluminium salt is needed for precipitating arsenious sulphide sol.

Apparatus

Three conical flasks (100 ml), a burette and a beaker.

Materials Required

Arsenious sulphide sol, 0.1 M sodium chloride solution. 0.011 M barium chloride solution, 0.001 M aluminium chloride solution.

Procedure

1. Take three conical flasks and label them as 1, 2, 3.
2. To each conical flask transfer 20 ml of the arsenious sulphide sol.
3. To the sol in the test-tube No. 1 add 0.1 M NaCl solution drop by drop with the help of a burette. Shake gently after the addition of each drop. Continue the addition till a yellow precipitate of arsenious sulphide is just formed. Note the volume of sodium chloride solution required for precipitation of arsenious sulphide sol.
4. Now, to the sol in conical flask No. 2 add 0.01 M $BaCl_2$ solution dropwise. Measure the volume when a yellow precipitate of arsenious sulphide is just formed.
5. Similarly, to the sol in the conical flask No. 3 add 0.001 M. $AlCl_3$ solution dropwise. Measure the volume when a yellow precipitate of arsenious sulphide is first formed.

Observations

Conical flask	Volume of As_2S_3 sol taken	Electrolyte solution added	Conc. of electro-lyte	Volume of electrolyte solution added	Total volume	Precipitation value
1.	20 ml	NaCl	0.1 M	x ml	$20 + x = V_1$ ml	$\frac{0.1 \times x \times 1000}{V_1}$
2.	20 ml	$BaCl_2$	0.01 M	y ml	$20 + y = V_2$ ml	$\frac{0.01 \times y \times 1000}{V_2}$
3.	20 ml	$AlCl_3$	0.001 M	z ml	$20 + z = V_3$ ml	$\frac{0.001 \times z \times 1000}{V_3}$

Result

The precipitation values of NaCl, $BaCl_2$ and $AlCl_3$ for As_2S_3 sol are in the order
NaCl > $BaCl_2$ > $AlCl_3$
On the other hand, the coagulating or the precipitating powers of these electrolytes are in the order
$AlCl_3$ > $BaCl_2$ > NaCl.

Precautions

1. The apparatus to be used should be cleaned thoroughly.
2. Look vertically down the conical flask for detecting the start of the precipitation.
3. Mixing of sol and electrolyte solution should be done by gentle inverting the corked test-tube. Do not shake them vigorously.

Emulsions and Emulsifying Agents

Emulsions are colloidal solutions in which disperse phase as well as dispersion medium are liquids. Emulsions can be broadly classified into two types:
1. Oil in water emulsions. In this type of emulsions, oil acts as disperse phase and water acts as dispersion medium. Some examples of this type of emulsions are milk, vanishing cream, etc.
2. Water in oil emulsions. In this type of emulsions, water acts as disperse phase and oil acts as dispersion medium. For example, butter, cod-liver oil, etc.

Preparation of Emulsions

The process of making an emulsion is known as emulsification. Emulsions may be obtained by vigorously agitating a mixture of both the liquids. But this gives an unstable emulsion. The dispersed drops at once come together and form a separate layer. To stabilize an emulsion, the addition of a small quantity of the third substance know as emulsifying agent or emulsifier is essential. Soaps and detergents are most frequently used as emulsifiers. They coat the drops of the emulsion and check them from coming together and the emulsion is thus stabilized. The other common stabilizing agents are

proteins, gum and agar-agar.

Demulsification

The decomposition of an emulsion into its constituent liquids is called demulsification. The various techniques applied for demulsification are freezing, boiling, filtration, centrifugation, electrostatic precipitation or chemical methods which destroy the emulsifying agents. For example, cream is separated from milk by centrifugation.

Applications of Emulsions

1. Washing action of soaps and detergents is due to the emulsification of grease and taking it away in the water along with dirt and dust present on grease.
2. A wide variety of pharmaceutical preparations are emulsions. For example, emulsion of cod liver oil. These emulsified oils are easily acted upon by the digestive juices in the stomach and hence are readily digested.
3. The disinfectants such as phenyl, Dettol, and Lysol give emulsions of the oil-in-water type when mixed with water.
4. Emulsions play an important role in industry. The metal ores are concentrated by froth-flotation process which involves the treatment of the pulverized ore in emulsion of pine oil.