

Non aqueous solvent

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Introduction

- Nonaqueous titration is the titration of substances dissolved in solvents other than water.
- It is the most common titrimetric procedure used in pharmacopoeial assays and serves a double purpose:
 - it is suitable for the titration of very weak acids and very weak bases, and
 - it provides a solvent in which organic compounds are soluble.
- The most commonly used procedure is the titration of organic bases with perchloric acid in anhydrous acetic acid.
- These assays sometimes take some perfecting in terms of being able to judge the endpoint precisely.

Solvents used in non aqueous titration

- Solvent which are used in non aqueous titration are called non aqueous solvent.
- They are following types:-
 1. Aprotic Solvent
 2. Protogenic Solvent
 3. Protophilic Solvent
 4. Amphiprotic Solvent

Aprotic solvents

- **Aprotic solvents** are neutral, chemically inert substances such as benzene and chloroform. They have a low dielectric constant, do not react with either acids or bases and therefore do not favor ionization.
- The fact that picric acid gives a colorless solution in benzene which becomes yellow on adding aniline shows that picric acid is not dissociated in benzene solution and also that in the presence of the base aniline it functions as an acid, the development of yellow color being due to formation of the picrate ion.
- Carbon tetrachloride and toluene come in this group; they possess low dielectric constants, do not cause ionization in solutes and do not undergo reactions with acids and bases.
- Aprotic solvents are frequently used to dilute reaction mixture

Protogenic solvents

- **Protogenic solvents** are acidic substances, e.g. sulfuric acid. They exert a leveling effect on bases.
- Anhydrous acids such as hydrogen fluoride and sulphuric acid fall in this category, because of their strength and ability to donate protons, they enhance the strength of weak bases.
- Ex:- sulphuric acid , formic acid, propanoic acid ,acetic anhydride etc.
- They have high dielectric constant and ionised because of their strength and ability to donate protons.

Protophilic Solvents :

- Protophilic solvents are the substances that possess a high affinity for protons. The over all reaction can be represented as:
 - $HB+S \leftrightarrow SH^+ + B^-$
- The equilibrium in this reversible reaction will be generally influenced by the nature of the acid and the solvent.
- Weak acids are normally used in the presence of strongly protophilic solvents as their acidic strengths are then enhanced and then become comparable to these of strong acids; this is known as the levelling effect.

Amphiprotic solvents

- Amphiprotic solvents have both protophilic and protogenic properties. Examples are acetic acid and the alcohols. They are dissociated to a slight extent. The dissociation of acetic acid, which is frequently used as a solvent for titration of basic substances, is shown in the equation below:
- $\text{CH}_3\text{COOH} \rightleftharpoons \text{H}^+ + \text{CH}_3\text{COO}^-$
- Here the acetic acid is functioning as an acid. If a very strong acid such as perchloric acid is dissolved in acetic acid, the latter can function as a base and combine with protons donated by the perchloric acid to form protonated acetic acid, an onium ion:
- $\text{HClO}_4 \rightleftharpoons \text{H}^+ + \text{ClO}_4^-$
- $\text{CH}_3\text{COOH} + \text{H}^+ \rightleftharpoons \text{CH}_3\text{COOH}_2^+$ (onium ion)
- Since the $\text{CH}_3\text{COOH}_2^+$ ion readily donates its proton to a base, a solution of perchloric acid in glacial acetic acid functions as a strongly acidic solution.

THANK YOU