CHAPTER – 3 Complexometric Titration

3.1 INTRODUCTION

Complexometric Titration or **Chelatometry** is a type of volumetric analysis wherein the coloured complex is used to determine the endpoint of the titration. Titration is one of the common method used in laboratories which determines the unknown concentration of an analyte that has been identified. It is a method used in quantitative chemical analysis.

It is sometimes termed as volumetric analysis as measurements of volume play a vital role. Here reagent is used as a standard solution, and they are called titrant. Titrant Volume is defined as the volume of a titrant that is reacted. Complexometric Titration is in the detection of mixtures of different metal ions present in the solution.

3.2 Principle of Complexometric Titration

Complexometric titration is a volumetric analysis where the endpoint of the analysis or titration is identified by the formation of a coloured complex.

3.3 Indicators

Calmagite and Eriochrome BlackT (EBT) are such indicators that change from blue to pink when they complex with calcium or magnesium. The endpoint of a complexometric EDTA titration using either Calmagite or EBT as the indicator is detected as the colour changes from pink to blue.

3.4 The endpoint detection

The endpoint detection in complexometric titration can be done by two methods.

1. Visual Method

One of the most common methods for determination of endpoint owing to its simplicity, least cost and accuracy. Following are some of the visual methods used for determining the end point of the complexometric titrations.

- Metallochromic or PM indicators
- pH indicators
- Redox indicators

2. Instrumental Method

Use of visual methods in determining the endpoint is not free from limitations including inaccuracy or human visual errors. Some instrumental techniques used in endpoint determination are:

- Photometry
- Potentiometry
- Miscellaneous methods.

3.5	EDTA Complexometric Titration

- EDTA called as ethylenediaminetetraacetic acid is a complexometric indicator consisting of 2 amino groups and four carboxyl groups called as Lewis bases.
- Edta is a hexadentate ligand because of its competence to denote six pair of lonely electrons due to the formation of covalent bonds.
- Even the presence of small metal ions would lead to a distinct change in the color. This leads to the formation of a weak complex.
- Complexing agents are less soluble in water, and most of them are free acids.
- They are used in volumetric Solutions. Before using them, they are converted into sodium salts that are feasible in water.
- Since they are characterised with less solubility in water, they are used for titration.
- Sometimes simple titration methods are used to determine the simple metal ions present in water. But to determine the exact number of metal ions present complexometric titration is used, and it is conducted using EDTA.