

**LIBYAN INTERNATIONAL MEDICAL UNIVERSITY
FACULTY OF PHARMACY**

**TYPES OF METALLOCHROMIC
INDICATORS**

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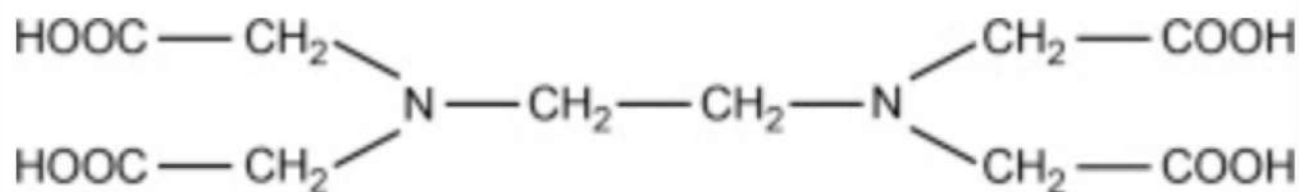


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Introduction

Complexometric titrations are used mainly to determine metal ions by use of complex-forming reactions. Although many complexing agents (cyanide, thiocyanate, fluoride, 1,2-diaminoethane, etc.) can be used for this purpose, in practice the titrants are almost always compounds having the iminodiacetic acid functional groups. The most widely applied are ethylenediaminetetraacetic acid

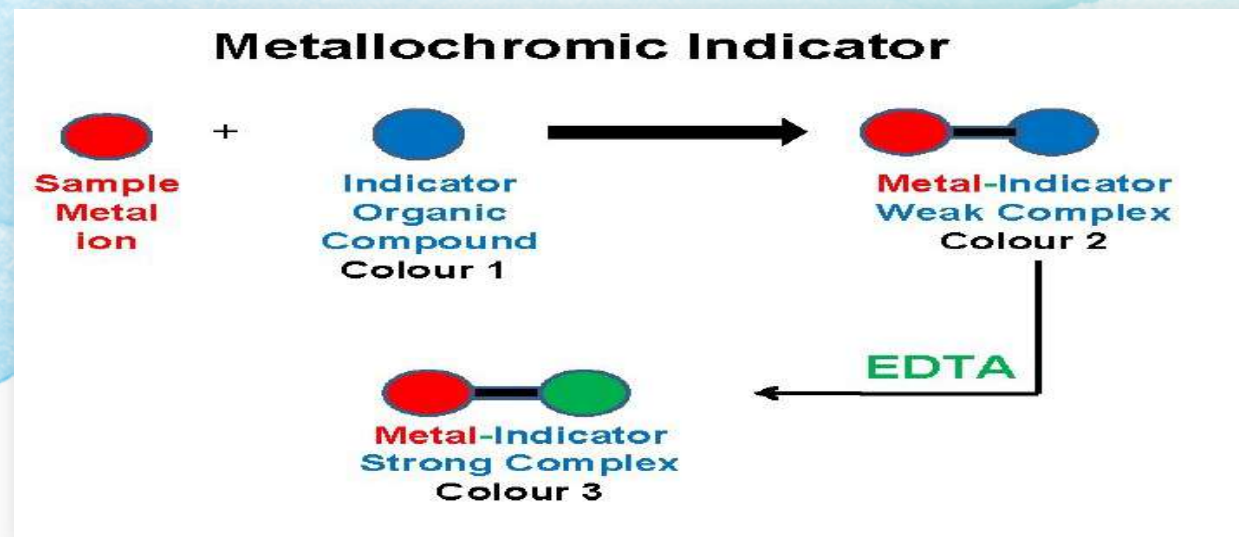


What is Metal Ion Indicator ?

- Metal ion indicator used to signal the end point in the titration. A metal ion indicator is a substance that changes color when it binds to metal ions in solution, Metal ion indicators tend to be polyprotic complexing agents.
- It is widely used in pharmaceutical industry to determine metal concentration in drugs.

PRINCIPLE OF INDICATION

The most common indicators in complexometric titrations are organic dyes which function by forming a colored complex with the metal ion being titrated. During the reaction, EDTA replaces the indicator to form a more stable complex with metal and when the reaction is completed the change for the color is observed.



COMMON INDICATORS FOR COMPLEXOMETRIC TITRATIONS

- Calcein with EDTA for calcium.
- Eriochrome Black for aluminum, cadmium, zinc, calcium and magnesium.
- Hematoxylin for copper.
- Xylenol orange for gallium, indium and scandium.

Types of EDTA Titration

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graph TD; A[Types of EDTA Titration] --> B[Direct]; A --> C[Indirect]; A --> D[Back]; A --> E[Displacement];
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Direct

Indirect

Back

Displacement

DIRECT TITRATION

- Many metals can be determined by direct titrations with EDTA (except for those in group 1 of periodic table)
- Weak metal complexes such as Ca^{2+} and Mg^{2+} should be titrated in basic solution using EBT as the indicator.

INDIRECT TITRATION

- The anion is first precipitated with a metal cation and the precipitate is washed and boiled with an excess of disodium EDTA solution to form the metal complex.

BACK TITRATION

- Back titration can be performed for the determination of several metal ions can not be titrated directly but form stable EDTA complexes.
- The procedure, a known amount of EDTA is added to the analyte sample solution and the excess is back titrated with a standard solution of “weak” metal ion, Mg^{2+} .

DISPLACEMENT TITRATION

- The technique only works when the unknown metal has tighter binding to EDTA than the Zn^{2+} or Mg^{2+} .
- MgY^{2-} or ZnY^{2-} complex is added to the solution of unknown metal ion composition.
- The technique only works when the unknown metal has tighter binding to EDTA than the Zn^{2+} or Mg^{2+} .

Applications of complexometric titrations

- Widely used in pharmaceutical industry to determine metal concentration.
- Widely used in analytical chemistry.
- Used for estimation of amount of total hardness in water.

SUMMARY

- ❖ Complexometric titrations are used mainly to determine metal ions by use of complex-forming reactions.
- ❖ The most common indicators in complexometric titrations are organic dyes.
- ❖ The main types of EDTA titrations are: Direct, indirect, back and displacement titration.
- ❖ Complexometric titrations is widely used in analytical chemistry.

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**Thank
you !**

