

Experiment

Estimation of Magnesium Sulphate

Aim:- To estimate the percentage purity of the given sample of **Magnesium Sulphate (MgSO₄·7H₂O)** by **complexometric titration** using **EDTA** as the titrant.

Reference:- Indian Pharmacopoeia by Ministry of Health And Family Welfare, Gov. of India, Volume I 2007.

Requirements:-

- 🧪 **Chemical Requirement:-** Standard EDTA solution (0.01 M), Magnesium sulphate solution (unknown strength), Buffer solution (pH 10, ammonium chloride + ammonium hydroxide), Eriochrome Black T indicator, Distilled water
- 🧪 **Glassware Requirement:-** Burette, Pipette (10 mL), Conical flask (250 mL), Measuring cylinder, Funnel, Beaker, Glass rod

Principle:

Magnesium sulphate can be estimated **complexometrically** using **EDTA**

(Ethylenediaminetetraacetic acid) as a titrant.

Magnesium ions (Mg²⁺) react with EDTA to form a stable **magnesium–EDTA complex** at a specific pH, indicated by a color change of the indicator.



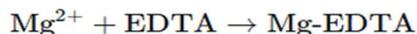
Procedure:

- Preparation of standard MgSO₄ solution:**
 - Weigh accurately **2.46 g** of MgSO₄·7H₂O and dissolve it in distilled water.
 - Transfer to a 250 mL volumetric flask and make up the volume with distilled water.
 - This gives **0.04 M** MgSO₄ solution approximately.
- Titration:**
 - Pipette **10 mL** of the prepared MgSO₄ solution into a conical flask.
 - Add **5 mL buffer solution (pH 10)**.
 - Add **2–3 drops** of Eriochrome Black T indicator.
 - The solution becomes **wine red**.
 - Titrate against **0.01 M EDTA** solution from the burette until the color changes from **wine red to pure blue**.
 - Note the burette reading.
- Repeat the titration to get **concordant readings**.

Observations Table:-

S.No	Burette Reading (Final - Initial)	Volume of EDTA used (mL)
1.	0.0 – 9.8	9.8
2.	0.0 – 9.9	9.9
3.	0.0 – 9.8	9.8

Mean Volume (V_1) = 9.83 mL

Calculations:

Since 1 mole of Mg^{2+} reacts with 1 mole of EDTA,

$$M_1 V_1 = M_2 V_2$$

Let

M_1 = Molarity of EDTA = 0.01 M

V_1 = Volume of EDTA = 9.83 mL

V_2 = Volume of MgSO_4 = 10 mL

M_2 = Molarity of MgSO_4 = ?

$$M_2 = \frac{M_1 V_1}{V_2} = \frac{0.01 \times 9.83}{10} = 0.00983 \text{ M}$$

To find amount of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ in 1 litre:

Molar mass of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ = 246.4 g/mol

Amount in 1 litre = $0.00983 \times 246.4 = 2.42\text{g/L}$

To find amount in 250 mL:

$$= \frac{2.42 \times 250}{1000} = 0.605 \text{ g}$$

If the weighed amount was 0.615 g, then:

$$\text{Percentage purity} = \frac{0.605}{0.615} \times 100 = 98.37\%$$

Result:-The percentage purity of the given sample of Magnesium Sulphate ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$) is $\approx 98.4\%$.

Viva-Voce Questions

1. What is complexometric titration?
2. What is the reaction involved in the estimation of magnesium sulphate?
3. What is the indicator used?
4. What is the role of EDTA in this titration?
5. What is the equivalent weight of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$?

www.pharmrecord.com