

Complex-Formation Titration
Determination of Zinc using EDTA

Zinc ion forms a stable water-soluble 1:1 complex with EDTA, which is the basis for the determination of Zn in this experiment. EDTA titrant and a standard Zn^{2+} solution are prepared. The EDTA solution is standardized by titration of aliquots of the standard zinc solution. The titration is carried out at pH 10 and uses the Eriochrome Black T indicator which changes color from “purple” to “pure blue” at the endpoint. Chapter 14 in the text should be studied in preparation for this experiment.

PREPARATION OF SOLUTIONS.

- EDTA solution. A 0.01 M EDTA solution is prepared from disodium ethylenediamine tetraacetate dehydrate ($\text{Na}_2\text{H}_2\text{T}\cdot 2\text{H}_2\text{O}$; FW 372). Weigh about 3.7 g of EDTA, transfer it to a 1.5 L beaker, fill to the 1.0 L mark. The salt dissolves slowly. Gently warm the solution using a hot plate and provide magnetic stirring. When all the salt is dissolved, transfer the solution to a 1.0 L bottle for storage.
- Standard Zn^{2+} solution. A standard solution of Zn^{2+} is prepared from the pure metal, which is provided as pieces of about 0.25 g. Weigh a piece accurately, transfer it to a 250 mL volumetric flask, add 10 mL of 3.0 M HNO_3 and warm on a hot plate (in the hood) for a few minutes. When all zinc is dissolved, dilute with deionized water to exactly 250 mL. Be sure to mix the solution thoroughly. Transfer this solution to a plastic bottle. Carefully rinse your volumetric flask and submit it to the instructor for preparation of your unknown.

STANDARDIZATION OF THE EDTA SOLUTION.

- Pipet a 25 mL aliquot of the standard zinc solution (about 0.4 millimole Zn^{2+}) into a 250 mL Erlenmeyer flask and add 25 mL of deionized water with a graduate cylinder.
- Adjust the pH of the solution to 10 using concentrated ammonia and pH test paper. Add the ammonia dropwise to avoid an excess which can decrease the sharpness of the end point.
- Add 7 drops of the Eriochrome Black T indicator solution.
- Titrate with EDTA until the color of the solution changes from “purple” to “pure blue” (the description of these color change depends on the observer).

ANALYSIS OF THE UNKNOWN.

- The unknown is a piece of zinc metal similar to the standard. It is supplied in a volumetric flask with 10 mL of 3.0 M HNO_3 already added to it. Complete the preparation of this solution (see standard Zn^{2+} solution) and analyze 25 mL aliquots in exactly the same way as the standards.

REPORT.

- Report the weight of the unknown Zn sample in milligrams.