

Complexometric Titrimetric Determination of Zinc in Dietary Supplements Using EDTA

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Introduction

Zinc is an essential trace element widely used in dietary supplements. Reliable determination of its content, therefore, is of particular importance for quality control. Among available analytical techniques, complexometric titration with ethylenediaminetetraacetic acid (EDTA) represents a standard, robust, and pharmacopoeially accepted method for the quantitative determination of zinc

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Results and Discussion

This method is based on the formation of a stable 1:1 complex between Zn^{2+} ions and EDTA, with the endpoint detected using an appropriate metallochromic indicator. According to the 11th European 11th Pharmacopoeia, titration is most commonly performed using xylenol orange as an indicator under slightly acidic to neutral conditions, where the color change enables precise determination of the equivalence point. Zinc determination can also be successfully carried out using eriochrome black T as an indicator in an ammoniacal buffer at pH 10.

The choice of indicator and pH conditions significantly affects the method's selectivity and accuracy, particularly in the presence of potentially interfering metal ions. Owing to its simple execution, high repeatability, and low cost, EDTA complexometric titration remains the method of choice for zinc analysis in the pharmaceutical industry and in regulatory quality control.

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Conclusion

Although zinc is quantified analytically as Zn^{2+} ions, the diversity of zinc chemical forms available in the dietary supplement market, such as zinc oxide, zinc picolinate, zinc citrate, and zinc gluconate, may significantly affect sample preparation, selectivity, and overall analytical reliability.

Differences in solubility, degree of dissociation, and the potential for complex formation with matrix components require adjustment of the analytical procedure, particularly during the dissolution step and pH control. Therefore, method validation or verification is necessary to ensure accuracy and repeatability of the results. In this context, EDTA complexometric titration remains a reliable method for zinc determination, provided that it is appropriately adapted and validated for the specific zinc form.

