



Designation: ~~E738-00~~ (Reapproved 2005) Designation: E738 - 11

Standard Test Method for Determination of Aluminum in Iron Ores and Related Materials by EDTA Complexometric Titration Titrimetry¹

This standard is issued under the fixed designation E738; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method² ~~covers the determination of aluminum in iron ores, concentrates, and agglomerates in the concentration range from 0.25 to 5% aluminum.~~ covers the determination of aluminum in iron ores, concentrates, and agglomerates in the compositional range from 0.25 % to 5 % aluminum.

NOTE 1—As used in this test method (except as related to the term *relative standard deviation*), “percent” or “%” refers to mass fraction (wt/wt) of the form g/100g.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*³

D1193 [Specification for Reagent Water](#)

E50 [Practices for Apparatus, Reagents, and Safety Considerations for Chemical Analysis of Metals, Ores, and Related Materials](#)

E135 [Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials](#)

E877 [Practice for Sampling and Sample Preparation of Iron Ores and Related Materials for Determination of Chemical Composition](#)

E882 [Guide for Accountability and Quality Control in the Chemical Analysis Laboratory](#)

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology E135.

4. Summary of Test Method

4.1 The sample is fused in a zirconium crucible with a mixed flux of sodium carbonate and sodium peroxide. The fused mass is dissolved in dilute ~~hydrochloric acid-HCL.~~ The R_2O_3 hydroxides are precipitated with ammonia and redissolved in hydrochloric acid. Iron, titanium, and so forth, are removed with cupferron and chloroform. ~~The aqueous phase is treated with nitric and perchloric acids and evaporated to dryness. After dissolving in dilute hydrochloric acid, the solution is filtered, and the filtrate is treated with an excess of ethylenediaminetetraacetic acid (EDTA). The excess EDTA is titrated with a standard zinc solution using xylenol orange indicator. Ammonium fluoride is added to release the EDTA bound to aluminum. This EDTA is then titrated with standard zinc solution, and the percent aluminum is calculated.~~ (Note 2) hydroxides are precipitated with ammonia and redissolved in HCL. Iron, titanium, and so forth, are removed with cupferron and chloroform. The aqueous phase is treated with H_2NO_3 and $HClO_4$ and evaporated to dryness. After dissolving in dilute HCL, the solution is filtered, and the filtrate is treated with an excess of ethylenediaminetetraacetic acid (EDTA). The excess EDTA is titrated with a standard zinc solution using xylenol orange indicator. Ammonium fluoride is added to release the EDTA bound to aluminum. This EDTA is then titrated with standard zinc solution, and the percent aluminum is calculated.

¹ This test method is under the jurisdiction of ASTM Committee E01 on Analytical Chemistry for Metals, Ores, and Related Materials and is the direct responsibility of Subcommittee E01.02 on Ores, Concentrates, and Related Metallurgical Materials.

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² Bhargava, O. P., “Complexometric Determination of Aluminum in Iron Ore, Sinter, Concentrates, and Agglomerates,” *Talanta*, Vol 26, 1979, pp. 146 to 148.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

NOTE 2— R_2O_3 hydroxides are rare earth sesquioxides such as La_2O_3 , Y_2O_3 , Ce_2O_3 , Gd_2O_3 , and Eu_2O_3 .

5. Significance and Use

5.1 This test method for the analysis of iron ore concentrates and agglomerates is primarily intended as a referee method to test for compliance with compositional specifications. It is assumed that all who use this test method will be trained analysts capable of performing common laboratory procedures skillfully and safely. It is expected that work will be performed in a properly equipped laboratory and that proper waste disposal procedures will be followed. Appropriate quality control practices shall be followed, such as those described in Guide E882.

6. Interferences

6.1 None of the elements normally found in iron ores interfere with this test method.

7. Apparatus

7.1 *Zirconium Crucible*, 50-mL.

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