



Standard Test Method for Determination of Titanium in Iron Ores and Related Materials by Diantipyrylmethane Ultraviolet Spectrometry¹

This standard is issued under the fixed designation E 878; 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 method covers the determination of titanium in iron ores, concentrates, and agglomerates in the concentration range from 0.01 to 6.0 % titanium.

1.2 *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:

D 1193 Specification for Reagent Water²

E 877 Practice for Sampling and Sample Preparation of Iron Ores³

E 882 Guide for Accountability and Quality Control in the Chemical Analysis Laboratory³

3. Summary of Test Method

3.1 The sample is decomposed by treatment with hydrochloric, nitric, and sulfuric acids, or by sintering with sodium peroxide, or by fusion with sodium tetraborate and sodium carbonate. Iron is reduced in an acid medium with ascorbic acid, the color is developed with diantipyrylmethane, and the absorbance is measured at approximately 385 nm.

4. Significance and Use

4.1 This test method is intended to be used for compliance with compositional specifications for titanium content. It is assumed that all who use these procedures 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 must be followed such as those described in Guide E 882.

5. Interferences

5.1 None of the elements normally found in iron ores interfere.

6. Reagents

6.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society where such specifications are available.⁴ Other grades may be used, provided it is first ascertained that the reagent is of sufficient high purity to permit its use without lessening the accuracy of the determination.

6.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water as defined by Type I of Specification D 1193.

6.3 *Ascorbic Acid Solution* (10 g/100 mL) (C₆H₈O₆)—Dissolve 10 g of ascorbic acid (C₆H₈O₆) in water and dilute to 100 mL. Prepare fresh as needed.

6.4 *Diantipyrylmethane Solution* (15 g/L) C₂₃H₂₄O₂N₄·H₂O—Dissolve 15 g of the reagent in about 300 mL of water and 30 mL of (H₂SO₄) (1 + 1) (7.10) and dilute to 1 L with water. If a residue remains, filter and store the filtrate in a brown bottle.

6.5 *Ferric Ammonium Sulfate* (100 g/L)—Dissolve 100 g of ferric ammonium sulfate (Fe₂(SO₄)₃·(NH₄)₂SO₄) in 800 mL of water containing 5 mL of H₂SO₄ (1 + 1) (6.11) and dilute to 1 L with water.

6.6 *Hydrochloric Acid* (1 + 1)—Mix 1 volume of concentrated hydrochloric acid (HCl) with 1 volume of water.

6.7 *Hydrochloric Acid* (1 + 4)—Mix 1 volume HCl with 4 volumes of water.

6.8 *Potassium Pyrosulfate* (K₂S₂O₇).

6.9 *Sodium Tetraborate (Anhydrous)* (Na₂B₄O₇)—Dry the commercial sodium tetraborate at 60 to 70°C, then at 160°C, and finally calcine at 400°C.

6.10 *Sodium Tetraborate/Sodium Carbonate* (Na₂B₄O₇/Na₂CO₃) *Fusion Mixture*—Mix 1 part of Na₂B₄O₇ and 1 part

¹ This test method is under the jurisdiction of ASTM Committee E-1 on Analytical Chemistry for Metals, Ores, and Related Materials and is the direct responsibility of Subcommittee E01.02 on Ores, Slags, Refractories, Cement, and Related Oxide Materials.

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² *Annual Book of ASTM Standards*, Vol 11.01.

³ *Annual Book of ASTM Standards*, Vol 03.06.

⁴ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmaceutical Convention, Inc. (USPC), Rockville, MD.