



Designation: E 342 – 99

Standard Test Method for Determination of Chromium Oxide in Chrome Ores by Permanganate Titrimetry¹

This standard is issued under the fixed designation E 342; 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 chromium oxide (Cr_2O_3) in chrome ores in the concentration range from 25 to 60 %.

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:*

E 50 Practices for Apparatus, Reagents, and Safety Precautions for Chemical Analysis of Metals²

E 276 Test Method for Particle Size or Screen Analysis at No. 4 (4.75-mm) Sieve and Finer for Metal-Bearing Ores and Related Materials²

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 fusion with sodium peroxide. After leaching in water and boiling to decompose peroxides, the solution is acidified with nitric and sulfuric acids. Residual chromium is oxidized to chromate with silver nitrate, potassium permanganate, and peroxydisulfate. The excess of permanganate is destroyed by the addition of sodium chloride. After cooling, the chromate is reduced by the addition of a measured excess of a ferrous ammonium sulfate, and the excess titrated with a standard permanganate solution.

4. Significance and Use

4.1 This test method is intended to be used for compliance with compositional specifications for chromium oxide 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 chrome ores interfere with this test method.

6. Reagents and Materials

6.1 *Purity and Concentration of Reagents*—The purity and concentration of the common chemical reagents used shall conform to Practices E 50. Special apparatus and reagents required are located in separate sections preceding the procedure.

6.2 *Ammonium Peroxydisulfate Solution* (250 g/L)—Reagent No. 106 (see Practices E 50).

6.3 *Ferrous Ammonium Sulfate, Standard Solution* (0.2 N)—Dissolve 78.4 g of ferrous ammonium sulfate ($\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$) in 1 L of cool H_2SO_4 (5+95). As the ferrous ammonium sulfate solution gradually weakens in reducing power, it is necessary to standardize it daily, or at the same time that the chrome ore is analyzed. To standardize, transfer 100 mL of $\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ to a 600-mL beaker, dilute to 300 mL with cold H_2SO_4 (5+95), add 2 mL of H_3PO_4 and 2 drops of ortho-phenanthroline ferrous sulfate (Ferroin).⁴ Titrate immediately with 0.2 N KMnO_4 solution to a faint, permanent pink color.

6.4 *Nitric Acid* (sp gr 1.42)—Concentrated nitric acid (HNO_3).

6.5 *Ortho-Phenanthroline Ferrous Sulfate Indicator Solution*—(0.025 M)—Reagent No. 122 (see Practices E 50).

6.6 *Phosphoric Acid* (sp gr 1.69)—Concentrated phosphoric acid (H_3PO_4).

6.7 *Potassium Permanganate Solution* (20 g/L)—Reagent No. 134.

6.8 *Potassium Permanganate, Standard Solution* (0.2 N)—Dissolve 6.4 g of KMnO_4 in 1 L of water. Standardize against

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, Concentrates, and Related Metallurgical Materials.

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² *Annual Book of ASTM Standards*, Vol 03.05.

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

⁴ Ferroin indicator distributed by G. F. Smith Chemical Co. has been found to be acceptable.