



Designation: E 508 – 98

Standard Test Method for Calcium and Magnesium in Iron Ores by Atomic Absorption Spectroscopy¹

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1. Scope

1.1 This test method covers the determination of calcium and magnesium in iron ores, concentrates, and agglomerates in the concentration range from 0.05 to 5 % of calcium and 0.05 to 3 % of magnesium.

1.2 *This standard does not purport to address all of the safety problems, 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 663 Practice for Flame Atomic Absorption Analysis³

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

3. Summary of Test Method

3.1 The sample is dissolved in hydrochloric acid with the addition of a small amount of nitric acid. After evaporation and dehydration, any insoluble residue is filtered, treated for the recovery of calcium and magnesium, and added to the main solution. The solution is aspirated into the flame of the atomic absorption spectrometer. For calcium, a nitrous oxide-acetylene burner is used, for magnesium, an air-acetylene burner is preferred (Note 1). The absorbed energy at the resonance line of the spectrum of calcium or magnesium, or both, is measured by atomic absorption spectroscopy and compared with that of the calibration solutions of the two elements.

NOTE 1—If a nitrous oxide burner is used for the determination of

magnesium, the sensitivity is decreased by a factor of about three.

If an air-acetylene burner is used for the determination of calcium, several elements, if present in percent amounts, interfere with the calcium determination. Also, lanthanum chloride must be employed and the sensitivity is decreased by a factor of about two.

4. Significance and Use

4.1 This test method is intended as a referee method for compliance with compositional specifications for impurity content. It is assumed that all who use this procedure will be trained analysts capable of performing common laboratory practices 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. Follow appropriate quality control practices such as those described in Guide E 882.

5. Interferences

5.1 None of the elements normally found in iron ores interfere with this test method (Note 1).

6. Apparatus

6.1 *Atomic Absorption Spectrometer*, meeting the following criteria:

6.1.1 *Minimum Sensitivity*—The absorbance of the highest calibration solution (see 7.3) must be at least 0.3.

6.1.2 *Curve-Linearity*—The difference between the readings of the highest calibration solutions (40 to 50 mL) must be more than 1.4 times the difference between the readings for the zero solutions and the lowest calibration solution (0 to 5 mL).

6.1.3 *Minimum Stability*—The coefficient of variation of a number of measurements of the highest calibration solution and of the zero calibration solution must be less than 1.5 % and 0.5 % respectively, relative to the measurement of the highest calibration solution.

NOTE 2—Use of a strip chart recorder or digital readout device, or both, is advisable.

NOTE 3—Instrument parameters will vary with each instrument. The following parameters were successfully used in several laboratories and they can be used as guidelines. In the case of calcium, solutions were aspirated into a nitrous oxide-acetylene flame of a premix burner. For magnesium an air-acetylene burner was used.

	Ca	Mg
Hollow cathode lamp, mA	15	15
Wavelength, λ, Å	4227	2852
Nitrous oxide flow rate, L/min	13.8	...

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.