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Magnesium Oxide

MgO 40.30

Magnesium oxide CAS RN®: 1309-48-4; UNII: 3A3U0GI71G.

DEFINITION

Magnesium Oxide, after ignition, contains NLT 96.0% and NMT 100.5% of magnesium oxide (MgO).

IDENTIFICATION

• A. [IDENTIFICATION TESTS—GENERAL \(191\), Chemical Identification Tests, Magnesium](#)

Sample: A solution in diluted [hydrochloric acid](#)

Acceptance criteria: Meets the requirements

ASSAY

• **PROCEDURE**

Diluted ammonium hydroxide: Dilute 67 g of [ammonium hydroxide](#) (about 75 mL) with [water](#) to 100 mL.

Buffer: Prepare ammonium chloride buffer pH 10 as follows. In a 100-mL volumetric flask, dissolve 5.4 g of [ammonium chloride](#) in 20 mL of [water](#), add 35 mL of [Diluted ammonium hydroxide](#), and dilute with [water](#) to volume.

Sample stock solution: 3.2 mg/mL of Magnesium Oxide prepared as follows. Ignite a portion of Magnesium Oxide to a constant weight in the temperature range of 800°–900° ± 25°. Weigh 320 mg of the ignited Magnesium Oxide into a 100-mL volumetric flask, dissolve in 20 mL of 2 N [hydrochloric acid](#), and dilute with [water](#) to volume.

Sample solution: Transfer 20.0 mL of the *Sample stock solution* to a 500-mL flask, and dilute with [water](#) to 300 mL. The *Sample solution* is equivalent to 64 mg of ignited Magnesium Oxide.

Titrimetric system

Mode: Direct titration

Titrant: [0.1 M edetate disodium VS](#)

Endpoint detection: Visual

Analysis: To the *Sample solution*, add 10 mL of *Buffer* and 50 mg of [eriochrome black T-sodium chloride indicator](#). Heat the sample to 40°, and titrate with the *Titrant* to a blue endpoint. Perform a blank determination, and make any necessary correction to determine the *Titrant* volume consumed by the *Sample solution* (V_s).

Calculate the volume of *Titrant*, V_{Ca} , in mL, consumed by calcium, which is present in the portion of Magnesium Oxide taken:

$$V_{Ca} = (W \times L_{Ca}) / (F_{Ca} \times 100)$$

W = amount of ignited Magnesium Oxide in the *Sample solution* (mg)

L_{Ca} = content of calcium as determined in the test for *Limit of Calcium* (%)

F_{Ca} = weight of calcium equivalent to each mL of *Titrant*, 4.008 mg

Calculate the percentage of magnesium oxide (MgO) in the portion of Magnesium Oxide taken:

$$\text{Result} = (V_s - V_{Ca}) \times (F_{MgO} / W) \times 100$$

V_s = volume of *Titrant* consumed by the *Sample solution* (mL)

V_{Ca} = volume of *Titrant* consumed by calcium (mL)

F_{MgO} = weight of Magnesium Oxide equivalent to each mL of *Titrant*, 4.030 mg

W = amount of the ignited Magnesium Oxide in the *Sample solution* (mg)

Acceptance criteria: 96.0%–100.5% after ignition

IMPURITIES

• **FREE ALKALI AND SOLUBLE SALTS**

Sample solution: Boil 2.0 g of Magnesium Oxide with 100 mL of [water](#) for 5 min in a covered beaker, and filter while hot. Allow to cool, and dilute with [water](#) to 100 mL.

Analysis 1: To 50 mL of the *Sample solution*, add [methyl red TS](#) and titrate with 0.10 N [sulfuric acid](#).

Acceptance criteria 1: NMT 2.0 mL of the acid is consumed.

Analysis 2: Evaporate 25 mL of the remaining *Sample solution* to dryness, and dry at 105° for 1 h.

Acceptance criteria 2: NMT 10 mg of the residue remains (2.0%).

• **ACID-INSOLUBLE SUBSTANCES**

Sample: 2.0 g of Magnesium Oxide

Analysis: Mix the *Sample* with 75 mL of [water](#), add [hydrochloric acid](#) in small portions with agitation until no more dissolves, and boil for 5 min. If an insoluble residue remains, filter, wash well with [water](#) until the last washing is free from chloride, and ignite.

Acceptance criteria: The weight of the ignited residue is NMT 2 mg (0.1%).

• **LIMIT OF CALCIUM**

[**NOTE**—Concentrations of the *Standard solutions* and the *Sample solution* may be modified to fit the linear or working range of the instrument.]

Dilute hydrochloric acid: Dilute 100 mL of [hydrochloric acid](#) with [water](#) to 1000 mL.

Lanthanum solution: 50 mg/mL of lanthanum prepared as follows. To 58.65 g of [lanthanum oxide](#) add 400 mL of [water](#), and add, gradually with stirring, 250 mL of [hydrochloric acid](#). Stir until dissolved, and dilute with [water](#) to 1000 mL.

Blank solution: Transfer 4 mL of the *Lanthanum solution* and 10 mL of *Diluted hydrochloric acid* to a 200 mL volumetric flask, and dilute with [water](#) to volume.

Standard stock solution: 1.000 mg/mL of calcium prepared as follows. Transfer 249.7 mg of calcium carbonate, previously dried at 300° for 3 h and cooled in a desiccator for 2 h, to a 100 mL volumetric flask. Dissolve in a minimum amount of [hydrochloric acid](#), and dilute with [water](#) to volume.

[**NOTE**—A commercially available atomic absorption standard solution for calcium may be used to prepare the *Standard stock solution*.]

Standard solution 1: 1.0 μ g/mL of calcium prepared as follows. Transfer 1.0 mL of *Standard stock solution* to a 1000 mL volumetric flask containing 20 mL of the *Lanthanum solution* and 40 mL of *Diluted hydrochloric acid*, and dilute with [water](#) to volume.

Standard solution 2: 5.0 μ g/mL of calcium prepared as follows. Transfer 5.0 mL of *Standard stock solution* to a 1000 mL volumetric flask containing 20 mL of the *Lanthanum solution* and 40 mL of *Diluted hydrochloric acid*, and dilute with [water](#) to volume.

Standard solution 3: 10.0 μ g/mL of calcium prepared as follows. Transfer 10.0 mL of *Standard stock solution* to a 1000 mL volumetric flask containing 20 mL of the *Lanthanum solution* and 40 mL of *Diluted hydrochloric acid*, and dilute with [water](#) to volume.

Standard solution 4: 15.0 μ g/mL of calcium prepared as follows. Transfer 15.0 mL of *Standard stock solution* to a 1000 mL volumetric flask containing 20 mL of the *Lanthanum solution* and 40 mL of *Diluted hydrochloric acid*, and dilute with [water](#) to volume.

Sample solution: 1.25 mg/mL of Magnesium Oxide prepared as follows. Transfer 250 mg of Magnesium Oxide, freshly ignited for 1 h in the temperature range of 800°–900° \pm 25°, to a beaker. Add 30 mL of *Diluted hydrochloric acid*, and stir until dissolved, heating if necessary. Transfer the solution so obtained to a 200 mL volumetric flask containing 4 mL of *Lanthanum solution*, and dilute with [water](#) to volume.

Instrumental conditions

(See [Atomic Absorption Spectroscopy \(852\)](#).)

Mode: Atomic absorption spectrophotometry

Analytical wavelength: 422.7 nm

Lamp: Calcium hollow-cathode

Flame: Nitrous oxide–acetylene

Analysis

Samples: *Blank solution*, *Standard solutions*, and *Sample solution*

Using the calibration graph, determine the concentration, C_s , in μ g/mL, of calcium in the *Sample solution*.

Calculate the percentage of calcium in the portion of Magnesium Oxide taken:

$$\text{Result} = (C_s \times F/C_u) \times 100$$

C_s = concentration of calcium in the *Sample solution* determined (μ g/mL)

F = unit conversion factor, 0.001 mg/ μ g

C_u = concentration of Magnesium Oxide in the *Sample solution* (mg/mL)

Acceptance criteria: NMT 1.1%

• [IRON \(241\), Procedures, Procedure 1](#)

Sample: 40 mg of Magnesium Oxide

Test preparation: Boil the *Sample* with 5 mL of 2 N [nitric acid](#) for 1 min. Cool, dilute with [water](#) to 50 mL, and mix. Dilute 25 mL of this solution with [water](#) to 45 mL, and add 2 mL of [hydrochloric acid](#).

Acceptance criteria: NMT 0.05%

SPECIFIC TESTS

• [Loss on Ignition \(733\)](#)

Sample: 500–1000 mg of Magnesium Oxide

Analysis: Transfer the *Sample* to a tared platinum crucible, and ignite in the temperature range of 800°–900° \pm 25° to constant weight.

Change to read:

- ▲ [BULK DENSITY OF POWDERS \(616\), Untapped Bulk Density, Method I](#)▲ (CN 1-MAY-2024) : Using the procedure specified in the chapter, determine the bulk density of Magnesium Oxide.

ADDITIONAL REQUIREMENTS

- **PACKAGING AND STORAGE:** Preserve in tight containers.
- **LABELING:** Label it to indicate its bulk density. The indicated density may be in the form of a range.

Auxiliary Information - Please [check for your question in the FAQs](#) before contacting USP.

Topic/Question	Contact	Expert Committee
MAGNESIUM OXIDE	Documentary Standards Support	SM32020 Small Molecules 3
REFERENCE STANDARD SUPPORT	RS Technical Services RSTECH@usp.org	SM32020 Small Molecules 3

Chromatographic Database Information: [Chromatographic Database](#)

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