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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 µg/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 µg/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 µg/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 µg/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° ± 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 µg/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 (µg/mL)

$F$  = unit conversion factor, 0.001 mg/µg

$C_u$  = 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° ± 25° to constant weight.

Acceptance criteria: NMT 10.0%

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	<a href="#">Documentary Standards Support</a>	SM32020 Small Molecules 3
REFERENCE STANDARD SUPPORT	RS Technical Services <a href="mailto:RSTECH@usp.org">RSTECH@usp.org</a>	SM32020 Small Molecules 3

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