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Magnesium Trisilicate

$2MgO \cdot 3SiO_2 \cdot xH_2O$ (anhydrous) 260.86

Silicic acid ($H_4Si_3O_8$), magnesium salt (1:2), hydrate;

Magnesium silicate hydrate ($Mg_2Si_3O_8 \cdot xH_2O$) CAS RN®: 39365-87-2; UNII: C2E1CI501T.

Anhydrous CAS RN®: 14987-04-3; UNII: FML8G1U0Y3.

DEFINITION

Magnesium Trisilicate is a compound of Magnesium Oxide and silicon dioxide with varying proportions of water. It contains NLT 20.0% of magnesium oxide (MgO) and NLT 45.0% of silicon dioxide (SiO_2).

IDENTIFICATION

- **A. Identification Tests—General ⟨191⟩, *Chemical Identification Tests, Magnesium***

  Sample solution: Mix 500 mg of Magnesium Trisilicate with 10 mL of 3 N hydrochloric acid, filter, and neutralize the filtrate to litmus paper with 6 N ammonium hydroxide.

  Acceptance criteria: Meets the requirements

- **B.**

  Analysis: Prepare a bead by fusing a few crystals of sodium ammonium phosphate on a platinum loop in the flame of a Bunsen burner. Place the hot, transparent bead in contact with Magnesium Trisilicate, and again fuse.

  Acceptance criteria: Silica floats about in the bead, producing, upon cooling, an opaque bead with a web-like structure.

ASSAY

- **Content of Magnesium Oxide**

  Sample: 1.5 g of Magnesium Trisilicate

  Titrimetric system

  Mode: Residual titration

  Titrant: 1 N sodium hydroxide VS

  Endpoint detection: Visual

  Analysis: Transfer the *Sample* to a 250-mL conical flask. Add 50.0 mL of 1 N sulfuric acid VS, and digest on a steam bath for 1 h. Cool to room temperature, add methyl orange TS, and titrate the excess acid with the *Titrant*. Each milliliter of 1 N sulfuric acid is equivalent to 20.15 mg of magnesium oxide (MgO).

  Acceptance criteria: NLT 20.0%

- **Content of Silicon Dioxide**

  Sample: 700 mg of Magnesium Trisilicate

  Analysis: Transfer the *Sample* to a small platinum dish. Add 10 mL of 1 N sulfuric acid, and heat on a steam bath to dryness, leaving the dish uncovered. Treat the residue with 25 mL of water, and digest on a steam bath for 15 min. Decant the supernatant through an ashless filter paper, with the aid of suction, and wash the residue, by decantation, three times with hot water, passing the washings through the filter paper. Finally transfer the residue to the filter, and wash thoroughly with hot water. Transfer the filter paper and its contents to the platinum dish previously used. Heat to dryness, incinerate, ignite strongly for 30 min, cool, and weigh. Moisten the residue with water, and add 6 mL of hydrofluoric acid and 3 drops of sulfuric acid. Evaporate to dryness, ignite for 5 min, cool, and weigh. [Note—The loss in weight represents the weight of silicon dioxide (SiO_2).]

  Acceptance criteria: NLT 45.0%

- **Ratio of Silicon Dioxide to Magnesium Oxide**

  Analysis: Divide the percentage of silicon dioxide (SiO_2) obtained in the *Assay* for *Content of Silicon Dioxide* by the percentage of magnesium oxide (MgO) obtained in the *Assay* for *Content of Magnesium Oxide*.

  Acceptance criteria: 2.10–2.37

IMPURITIES

- **Soluble Salts**

  Sample solution: Boil 10.0 g of Magnesium Trisilicate with 150 mL of water for 15 min. Cool to room temperature, allow the mixture to stand for 15 min, filter with the aid of suction, transfer the filtrate to a 200-mL volumetric flask, and dilute with water to volume.

Analysis: Evaporate 50.0 mL of the *Sample solution*, representing 2.5 g of Magnesium Trisilicate, in a tared platinum dish to dryness, and ignite gently to constant weight.

[NOTE—Keep the remaining *Sample solution* for use in the tests for *Chloride* and *Free Alkali* and the residue for use in the test for *Sulfate*.]

Acceptance criteria: NMT 38.0 mg (1.5%) of residue remains.

- **CHLORIDE AND SULFATE ⟨221⟩, *Chloride***

Standard solution: 0.020 N hydrochloric acid VS

Sample solution: 20 mL of the *Sample solution* from the test for *Soluble Salts*, equivalent to 1 g of Magnesium Trisilicate

Acceptance criteria: The *Sample solution* shows no more chloride than 0.75 mL of the *Standard solution* (0.055%).

- **SULFATE**

Sample: Residue obtained in the test for *Soluble Salts*.

Analysis: Add 2 mL of hydrofluoric acid to the *Sample*, and evaporate on a steam bath to dryness. Mix the residue with water, transfer to a filter, and wash, using approximately 50 mL of water for the complete procedure. Heat the filtrate to boiling, and add 0.1 mL of hydrochloric acid and 5 mL of barium chloride TS. Maintain the mixture near its boiling point for 1 h, filter, wash the precipitate thoroughly with water, dry, and ignite to constant weight.

Acceptance criteria: NMT 30 mg (0.5%) of residue remains

- **FREE ALKALI**

Sample solution: 20 mL of the *Sample solution* from the test for *Soluble Salts*, equivalent to 1 g of Magnesium Trisilicate

Analysis: Add 2 drops of phenolphthalein TS to the *Sample solution*.

Acceptance criteria: If a pink color is produced, NMT 1.0 mL of 0.10 N hydrochloric acid is required to discharge it.

Change to read:

- **▲ARSENIC ⟨211⟩, *Procedures, Procedure 1*▲** (CN 1-JUN-2023)**:** NMT 8 ppm

SPECIFIC TESTS

- **WATER DETERMINATION ⟨921⟩, *Method III***

Sample: 1 g of Magnesium Trisilicate

Analysis: Weigh the *Sample* in a tared platinum crucible provided with a cover. Gradually apply heat to the crucible at first, then strongly ignite to constant weight.

Acceptance criteria: 17.0%–34.0%

- **ACID-CONSUMING CAPACITY**

Sample solution: Transfer 200 mg of Magnesium Trisilicate into a glass-stoppered, 125-mL conical flask. Add 30.0 mL of 0.1 N hydrochloric acid VS and 20.0 mL of water. Place the flask in a bath maintained at 37°, and shake the mixture occasionally during a period of 4 h but leave the mixture undisturbed during the last 15 min of the heating period. Cool to room temperature, and use the supernatant.

Titrimetric system

Mode: Residual titration

Titrant: 0.1 N sodium hydroxide VS

Endpoint detection: Visual

Analysis: To 25.0 mL of the *Sample solution*, add methyl red TS, and titrate the excess acid with the *Titrant*.

Acceptance criteria: 140–160 mL of 0.1 N hydrochloric acid VS is consumed per gram of Magnesium Trisilicate, calculated on the anhydrous basis.

ADDITIONAL REQUIREMENTS

- **PACKAGING AND STORAGE:** Preserve in tight containers.

Auxiliary Information - Please check for your question in the FAQs before contacting USP.

Topic/Question	Contact	Expert Committee
MAGNESIUM TRISILICATE	Documentary Standards Support	SM32020 Small Molecules 3

Chromatographic Database Information: Chromatographic Database

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