

MAGNESIUM SILICATE, synthetic

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SYNONYMS

INS No. 553(i)

DEFINITION

Magnesium silicate (synthetic) is manufactured by the precipitation reaction between sodium silicate and a soluble magnesium salt. The aqueous suspension of the precipitate is filtered and the collected solid washed, dried, classified for particle size and packaged. The finest material is intended for use as an anticaking agent and the coarser particles are for use as a filtering aid. The moisture content of the material meant for use as an anticaking agent is kept to less than 15%. Although magnesium silicate is of variable composition, the molar ratio of MgO to SiO₂ is approximately 2:5.

Chemical name

Magnesium silicate

C.A.S. number

1343-88-0

Assay

Not less than 15% of MgO and not less than 67% of SiO₂, calculated on the ignited basis.

DESCRIPTION

Very fine, white, odourless powder, free from grittiness

FUNCTIONAL USES

Anticaking agent, filtering aid

CHARACTERISTICS

IDENTIFICATION

Solubility (Vol. 4)

Insoluble in water

pH (Vol. 4)

7.0-11.0 (1 in 10 slurry)

Magnesium (Vol. 4)

Mix about 0.5 g of the sample with 10 ml of dilute hydrochloric acid TS, filter, and neutralize the filtrate to litmus paper with ammonia TS. The neutralized filtrate gives a positive test for magnesium.

Silicate

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 the sample, and again fuse. Silica floats about in the bead, producing, upon cooling, an opaque bead with a web-like structure.

PURITY

Loss on drying (Vol. 4)

Not more than 15% (for material used as an anticaking agent (105°, 2 h))
Retain the dried sample for determination of loss on ignition.

Loss on ignition (Vol. 4)

Not more than 15% on the dried basis

Weigh to the nearest 0.1 mg, 1 g of the dried sample in a tared platinum crucible provided with a cover. Gradually apply heat to the crucible at first, then strongly ignite at 900/1000° for 20 min. Cool, weigh and calculate as percentage.

Free alkali

Not more than 1% (as NaOH)

Add 2 drops of phenolphthalein TS to 20 ml of dilute filtrate prepared in the test for Soluble salts (see below), representing 1 g of the sample. Not more than 2.5 ml of 0.1 N hydrochloric acid should be required to discharge the pink colour produced.

Soluble salts

Not more than 3%

Boil 10 g of the sample with 150 ml of water for 15 min. Cool to room temperature, and add water to restore the original volume. Allow the mixture to stand for 15 min, and filter until clear. Retain 20 ml of the filtrate for the test Free alkali. Evaporate 75 ml of the filtrate, representing 5 g of the sample in a tared platinum dish on a steam bath to dryness, and ignite gently to constant weight. Cool, weigh and calculate as percentage (the weight of the residue should not exceed 150 mg).

Fluoride (Vol. 4)

Not more than 10 mg/kg

Weigh 2.5 g of the sample to the nearest mg and proceed as directed in the Fluoride Limit Test (Method I or III).

Lead (Vol. 4)

Not more than 5 mg/kg

Determine using an AAS/ICP-AES technique appropriate to the specified level. The selection of sample size and method of sample preparation may be based on principles of methods described in Volume 4 (under "General Methods, Metallic Impurities").

METHOD OF ASSAY

Magnesium oxide and silicon dioxide: Weigh about 0.5 g of the sample to the nearest 0.1 mg, in a platinum or nickel crucible, add 5 g potassium hydroxide and 2 g boric acid, mix and melt completely using a torch burner (alkali fusion) and allow to stand at room temperature. Place the reaction product along with crucible in a 250-ml PTFE beaker, add 150 ml hot deionized water and dissolve residue by agitation. Wash the crucible with hot deionized water and remove it. Add 50 ml hydrochloric acid and transfer the contents into a 250-ml volumetric flask. Wash the beaker three times with hot deionized water, transfer the washings to the volumetric flask and make up to volume (Solution A). Prepare the test solution by diluting Solution A with 2% hydrochloric acid solution. Analyze magnesium and silica in the test solution by ICP-AES technique (Vol. 4). Set instrument parameters as specified by the instrument manufacturer and use the analytical lines for Si (251.611 nm) and Mg (279.553 nm). Read the concentration (as µg/ml) of Mg and Si from respective standard curves. Calculate the magnesium oxide and silicon dioxide content of the sample, on the ignited basis, using the formula:

$$\%MgO \text{ (on the ignited basis)} = \frac{4.1458 \times C \times DF}{W \times [100 - (\%LOD + \%LOI)]}$$

$$\%SiO_2 \text{ (on the ignited basis)} = \frac{5.3504 \times C \times DF}{W \times [100 - (\%LOD + \%LOI)]}$$

where

C is concentration of Mg or Si in the test solution, $\mu\text{g/ml}$;

DF is dilution factor (dilution of Solution A to get test solution);

W is weight of sample, g;

%LOD is % loss on drying; and

%LOI is % loss on ignition.