CALCIUM SILICATE

Specifications prepared at the 80th JECFA (2015) and published in FAO JECFA Monographs 17 (2015), superseding tentative specifications prepared at the 77th JECFA (2013), published in FAO JECFA Monographs 14 (2013). An ADI 'not specified' for silicon dioxide and certain silicates including calcium silicate was established at the 29th JECFA (1985)

SYNONYMS Silicic acid, calcium salt; calcium silicon oxide; INS No. 552

DEFINITION Calcium silicate is an inorganic substance that is a hydrous or anhydrous substance with varying proportions of calcium as calcium oxide, and silicon as silicon dioxide. It is prepared by various reactions between siliceous material (e.g. diatomaceous earth) and calcium compounds (e.g. lime, calcium hydroxide).

Chemical names Calcium silicate

C.A.S. number 1344-95-2

Chemical formula $xCaO \cdot ySiO_2 \cdot zH_2O$

Assay Not less than 50% and not more than 95% of silicon dioxide (SiO_2) and not less than 3% and not more than 35% of calcium oxide (CaO), calculated on the ignited basis.

DESCRIPTION Very fine, white or off-white powder with low bulk density and high physical water absorption

FUNCTIONAL USES Anticaking agent, processing aid (filtering aid)

CHARACTERISTICS

IDENTIFICATION

Solubility (Vol. 4) Insoluble in water and ethanol

pH (Vol. 4) 8.4-12.5 (5% slurry)

Test for calcium Passes test
See description under TESTS

Test for silicon Passes test
See description under TESTS

PURITY

Loss on drying (Vol. 4) Not more than 10% (105°, 2 h)

Loss on ignition (Vol. 4)	5.0–14.0% on the dried basis (1000°, constant weight)
Fluoride (Vol. 4)	Not more than 50 mg/kg Weigh 1 g of the sample to the nearest mg, and proceed as directed in the Fluoride Limit Test (Method II).
Impurities soluble in 0.5 M hydrochloric acid	Lead : Not more than 5 mg/kg Arsenic: Not more than 3 mg/kg See description under TESTS

TESTS

IDENTIFICATION TESTS

Test for calcium and silicon	Prepare the test solution as shown under method of assay. Analyze calcium and silicon in the test solution by ICP-AES technique (Vol. 4). Set instrument parameters as specified by the instrument manufacturer, use the analytical lines for Ca (393.366 nm) and Si (251.611 nm).

PURITY TESTS

Impurities soluble in 0.5 M hydrochloric acid	Extract 20 g of finely ground sample under reflux conditions with 100 ml of 0.5 M hydrochloric acid (spectroscopic grade) for 30 min. Let solution cool, then, filter through a 0.1 µm membrane filter. Wash the filter twice with hot 0.5 M hydrochloric acid. Combine the filtrate and wash solution in a 200 ml volumetric flask and make up to volume with 0.5 M hydrochloric acid. Determine arsenic using an AAS (Hydride generation) technique; and lead using an AAS (Electrothermal atomization) technique. See “Metallic impurities” in the Combined Compendium of Food Additive Specifications (Volume 4).

METHOD OF ASSAY 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 and allow to stand at room temperature. Place the reaction product along with crucible into 150 ml hot deionized water in a 250-ml PTFE beaker 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 polypropylene 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. Analyze calcium and silicon in the test solution by ICP-AES technique (Vol. 4). Set instrument parameters as specified by the instrument manufacturer. Use analytical lines for Ca (393.366 nm) and Si (251.611 nm). Read the concentration of Ca and Si in sample solution (as µg/ml) from respective standard curves. Calculate the calcium oxide and silicon dioxide content of the sample on the anhydrous basis using the formula:

$$\mathrm{CaO}\ (\%) = \frac{1.399 \times \mathrm{C} \times 250 \times \mathrm{DF}}{\mathrm{W} \times 10^{6}} \times 100$$

$$\mathrm{SiO_2}\ (\%) = \frac{2.139 \times \mathrm{C} \times 250 \times \mathrm{DF}}{\mathrm{W} \times 10^6} \times 100$$

where

C is concentration of Ca or Si in the test solution, µg/ml
W is weight of sample on the ignited basis, g
DF is dilution factor (dilution of Solution A to test solution).