Sodium Chloride

Salt

NaCl Mol wt 58.44

DESCRIPTION

Salt is a generic term applied to commercially produced sodium chloride. It is available in various crystalline forms, referred to as evaporated salt, rock salt, solar salt, or simply salt. It may contain up to 2% (total) of suitable food-grade anticaking, free-flowing, or conditioning agents, either singly or in combination. It may contain not more than 13 ppm of sodium ferrocyanide, or not more than 25 ppm of green ferric ammonium citrate as crystal-modifying and anticaking agents. If labeled as iodized, it contains not less than 0.006% and not more than 0.010% of potassium iodide.

Sodium chloride is a transparent to opaque, white crystalline solid of variable particle size. (Rock salt may be white to off-white in color.) It remains dry in air at a relative humidity below 75%, but becomes deliquescent at higher humidities. One g is soluble in 2.8 ml of water at 25°, in 2.7 ml of boiling water, and in about 10 ml of glycerin. Sodium chloride containing water-insoluble anticaking, free-flowing, and conditioning agents may produce cloudy solutions, or may dissolve incompletely. A 1 in 20 solution usually has a pH between 5.5 and 8.5 (the pH may be higher if alkaline conditioning agents have been added).

REQUIREMENTS

Identification

It gives positive tests for *Sodium*, page 517, and for *Chloride*, page 516.

Assay

Evaporated salt with up to 2% of suitable free-flowing or conditioning agents and anticaking agents such as sodium ferrocyanide: Not less than 97.5% of NaCl after drying at 625° for 2 h.

Evaporated salt with only anticaking agents such as sodium ferrocyanide: Not less than 99.0% after drying at 625° for 2 h.

Rock or solar salt: Not less than 97.5% of NaCl after drying at 625° for 2 h, the remainder consisting chiefly of minor amounts of naturally occurring components such as alkaline and/or alkaline earth sulfates and chlorides.

Arsenic (as As) Not more than 1 ppm.

Calcium and Magnesium Not more than 2%.

Heavy Metals (as Pb) Not more than 4 ppm.

Iodine Not less than 0.006% and not more than 0.010% of potassium iodide. (NOTE: This specification applies only to iodized salt.)

Iron Not more than 0.0016% of Fe. (NOTE: This specification applies only to products to which green ferric ammonium citrate has been added.)

Loss on Drying Not more than 0.5%.

Sodium Ferrocyanide Not more than 0.0013% of anhydrous $Na_4Fe(CN)_6$. (NOTE: This specification applies only to products to which sodium ferrocyanide has been added.)

TESTS

NOTE: In the following procedures, it may be necessary to filter the sample solutions to avoid interference by insoluble or suspended anticaking, free-flowing, or conditioning agents.

Assay Weigh accurately about 250 mg of the sample, previously dried at 625° for 2 h, and dissolve it in 50 ml of water in a glass-stoppered flask. Add, while agitating, 3 ml of nitric acid, 5 ml of nitrobenzene, 50.0 ml of 0.1 *N* silver nitrate, and 2 ml of ferric ammonium sulfate TS. Shake well, and titrate the excess silver nitrate with 0.1 *N* ammonium thiocyanate. Each ml of 0.1 *N* silver nitrate is equivalent to 5.844 mg of NaCl.

Arsenic A solution of 3 g of the sample in 25 ml of water meets the requirements of the *Arsenic Test*, page 464.

Calcium and Magnesium

Standard EDTA Solution Dissolve 4.0 g of disodium EDTA, $C_{10}H_{14}N_2Na_2O_8.2H_2O$, in sufficient water to make 1000 ml.

Magnesium Sulfate Solution Dissolve 2.6 g of magnesium sulfate, $MgSO_4.7H_2O$, in sufficient water to make 1000 ml.

Buffer Solution (*a*) Initial Preparation: Transfer 67.5 g of ammonium chloride into a 1000-ml volumetric flask, and dissolve in 570 ml of concentrated ammonium hydroxide. Use 2 ml of this solution as directed below under *Titer Determination*. (*b*) Final preparation: Pipet 50.0 ml of *Magnesium Sulfate Solution* into the flask, add exactly the volume *T*, in ml, of *Standard EDTA Solution*, determined as directed below under *Titer Determination*, then dilute to volume with water, and mix.

Titer Determination Pipet 50.0 ml of *Magnesium Sulfate Solution* into a 400-ml beaker, and add 200 ml of water, 2 ml of *Buffer Solution* (initial preparation), 1.0 ml of potassium cyanide solution (1 in 20), and 5 drops of eriochrome black TS or other suitable indicator. Titrate with the *Standard EDTA Solution*, while stirring with a magnetic stirrer, to a true blue endpoint. Record the volume *T*, in ml, of *Standard EDTA Solution* equivalent to 50.0 ml of the *Magnesium Sulfate Solution*.

Standardization of EDTA Solution Transfer about 1 g, accurately weighed, of primary standard calcium carbonate, $CaCO_3$, into a 1000-ml volumetric flask, dissolve in 800 ml of water containing 5 ml of concentrated hydrochloric acid,

dilute to volume with water, and mix. Pipet 25.0 ml of this solution into a 400-ml beaker, and add 200 ml of water, 2 ml of *Buffer Solution* (final preparation), 1.0 ml of potassium cyanide solution (1 in 20), and 20 drops of eriochrome black TS or other suitable indicator. Titrate with the *Standard EDTA Solution*, stirring with a magnetic stirrer, to a true blue endpoint. Calculate the factor *F*, giving the number of mg of Ca equivalent to 1.0 ml of *Standard EDTA Solution*, by the formula $10.011w/v$, in which w is the exact weight, in g, of the primary standard calcium carbonate taken, and v is the volume, in ml, of the *Standard EDTA Solution* required in the titration.

Sample Preparation for Rock and Solar Salt Transfer 50.0 g of the sample into a 500-ml volumetric flask, dissolve in 400 ml of water containing 2 ml of concentrated hydrochloric acid, dilute to volume with water, and mix. Filter a 50-ml aliquot, then pipet 10.0 ml of the filtrate into a 400-ml beaker, and add 190 ml of water.

Sample Preparation for Evaporated Salt Transfer 10.0 g of the sample into a 400-ml beaker, and dissolve in 100 ml of water. If free-flowing agents are present, filter and rinse quantitatively. Dilute the solution or filtrate to 200 ml with water.

Procedure To the *Sample Preparation* add 5 ml of *Buffer Solution* (final preparation), 1 ml of potassium cyanide solution (1 in 20), and 5 drops of eriochrome black TS or other suitable indicator. Begin stirring with a magnetic stirrer, and titrate with *Standard EDTA Solution* to a true blue endpoint, recording the volume, in ml, required as *V*. Calculate the ppm of total calcium and magnesium (both expressed as Ca) in the sample by the formula

$$V \times F \times 1000/W,$$

in which *W* is the weight, in g, of salt sample in the final solution titrated.

Heavy Metals A solution of 5 g of the sample in 25 ml of water meets the requirements of the *Heavy Metals Test*, page 512, using 20 µg of lead ion (Pb) in the control (*Solution A*).

Iodine Transfer about 20 g of the sample, accurately weighed, into a 600-ml beaker, and dissolve in about 300 ml of water. Add a few drops of methyl orange TS, neutralize the solution with phosphoric acid (85%), and then add 1 ml excess of the acid. Add 25 ml of bromine TS and a few glass beads, boil until the solution is clear, then boil for an additional 5 min. Add about 50 mg of salicylic acid crystals, 1 ml of phosphoric acid, and 10 ml of potassium iodide solution (1 in 20), and titrate to a pale yellow color with 0.01 *N* sodium thiosulfate. Add 1 ml of starch TS, and continue the titration to the disappearance of the blue color. Each ml of 0.01 *N* sodium thiosulfate is equivalent to 0.2767 mg of KI.

Iron Dissolve 625.0 mg of the sample in 10 ml of diluted hydrochloric acid TS, and dilute to 50 ml with water. Add about 40 mg of ammonium persulfate crystals and 10 ml of ammonium thiocyanate TS. Any red or pink color does not exceed that produced by 1.0 ml of *Iron Standard Solution* (10 µg Fe) in an equal volume of solution containing 2 ml of hydrochloric acid and the quantities of ammonium persulfate and ammonium thiocyanate used in the test.

Loss on Drying, page 518 Dry at 110° for 2 h.

Sodium Ferrocyanide Dissolve 9.62 g of the sample in 80 ml of water in a 150-ml glass-stoppered cylinder or flask. Prepare a standard solution containing 125 µg of $Na_4Fe(CN)_6$ in each ml by dissolving 99.5 mg of $Na_4Fe(CN)_6{\cdot}10H_2O$ in 500.0 ml of water, then transfer 1.0 ml of this solution into a similar 150-ml container for the control. To each container add 2 ml of ferrous sulfate TS and 1 ml of diluted sulfuric acid TS, dilute to 100 ml with water, and mix. Transfer 50-ml portions of the respective solutions into matched color-comparison tubes. The sample solution shows no more blue color than the control.

Packaging and Storage Store in well-closed containers.

Labeling Label the product to indicate whether or not it is iodized.

Functional Use in Foods Nutrient; preservative; flavoring agent and intensifier; curing agent; dough conditioner.