Institute of Medicine
Food and Nutrition Board
Committee on Food Chemicals Codex

Revised Monograph - Sodium Tripolyphosphate

Please send comments to the Committee on Food Chemicals Codex, National Academy of Sciences, FO 3042, 2101 Constitution Avenue, N.W., Washington, DC 20418 or email them to fcc@nas.edu. All comments must be received by December 15, 1996, for consideration for the First Supplement.

June 25, 1996

Sodium Tripolyphosphate

Pentasodium Triphosphate; Triphosphate; Sodium Triphosphate

$Na_5P_3O_{10}$ Formula wt 367.86

INS: 451(i) CAS: [7758-29-4]

DESCRIPTION

Sodium Tripolyphosphate is anhydrous or contains six molecules of water of hydration. It occurs as white, slightly hygroscopic granules, or as a powder. It is freely soluble in water. The pH of a 1 in 100 solution is about 9.5.

Functional Use in Foods Texturizer; sequestrant.

REQUIREMENTS

Identification

A. A 1 in 20 solution gives positive tests for Sodium, Appendix IIIA.

B. To 1 mL of a 1 in 100 solution add a few drops of silver nitrate TS. A white precipitate is formed that is soluble in 1.7 N nitric acid.

Assay Anhydrous: not less than 85.0% of $Na_5P_3O_{10}$; hexahydrate: not less than 65.0% of $Na_5P_3O_{10}$.

Arsenic (as As) Not more than 3 mg/kg.

Fluoride Not more than 0.005%.

Heavy Metals (as Pb) Not more than 10 mg/kg.

Insoluble Substances Not more than 0.1%.

Lead Not more than ~~5~~2 mg/kg.

TESTS

Assay

Potassium Acetate Buffer (pH 5.0) Dissolve 78.5 g of potassium acetate in 1000 mL of water, and adjust the pH of the solution to 5.0 with glacial acetic acid. Add a few mg of mercuric iodide to inhibit mold growth.

0.3 M Potassium Chloride Solution Dissolve 22.35 g of potassium chloride in water, add 5 mL of Potassium Acetate Buffer, dilute with water to 1000 mL, and mix. Add a few mg of mercuric iodide.

0.6 M Potassium Chloride Solution Dissolve 44.7 g of potassium chloride in water, add 5 mL of Potassium Acetate Buffer, dilute with water to 1000 mL, and mix. Add a few mg of mercuric iodide.

1 M Potassium Chloride Solution Dissolve 74.5 g of potassium chloride in water, add 5 mL of Potassium Acetate Buffer, dilute to 1000 mL with water, and mix. Add a few mg of mercuric iodide.

Chromatographic Column Use a standard chromatographic column, 20- to 40-cm in length, 20- to 28-mm in id, with a sealed-in, coarse-porosity fritted disk. If a stopcock is not provided, attach a stopcock having a 3- to 4-mm diameter bore to the outlet of the column with a short length of flexible vinyl tubing.

Procedure Close the column stopcock, fill the space between the fritted disk and the stopcock with water, and connect a vacuum line to the stopcock. Prepare a 1:1 water slurry of Dowex 1 × 8, chloride form, 100- to 200- or 200- to 400-mesh, or a comparable grade of styrene–divinylbenzene ion exchange resin, and decant off any very fine particles and any foam. Do this two or three times or until no more finely suspended material or foaming is observed. Fill the column with the slurry, and open the stopcock to allow the vacuum to pack the resin bed until the water level is slightly above the top of the resin, then immediately close the stopcock. Do not allow the liquid level to fall below the resin level at any time. Repeat this procedure until the packed resin column is 15 cm (about 6 in.) above the fritted disk. Place one circle of tightly fitting glass-fiber filter paper on top of the resin bed, then place a perforated polyethylene disk on top of the paper. Alternatively, a loosely packed plug of glass wool may be placed on top of the bed. Close the top of the column with a rubber stopper in which a 7.6-cm length of capillary tubing (1.5-mm id, 7-mm od) has been inserted through the center, so that about 12 mm of the tubing extends through the bottom of the stopper. Connect the top of the capillary tubing to the stem of a 500-mL separator with flexible vinyl tubing, and clamp the separator to a ring stand above the column. Wash the column by adding 100 mL of water to the separator with all stopcocks closed. First open the separator stopcock, then open the column stopcock. The rate of flow should be about 5 mL/min. When the separator is empty, close the stopcock on the column, then close the separator stopcock.

Transfer about 500 mg of the sample, accurately weighed, into a 250-mL volumetric flask, dissolve and dilute to volume with water, and mix. Transfer 10.0 mL of this solution into the separator, open both stopcocks, and allow the solution to drain into the column, rinsing the separator with 20 mL of water. Discard the eluate.

Add 370 mL of 0.3 M Potassium Chloride Solution to the separator, and allow this solution to pass through the column, discarding the eluate. Add 250 mL of 0.6 M Potassium Chloride Solution to the column, allow the solution to pass through the column, and receive the eluate in a 400-mL beaker. (To ensure a clean column for the next run, pass 100 mL of 1 M Potassium Chloride Solution through the column, and then follow with 100 mL of water. Discard all washings.) To the beaker add 15 mL of nitric acid, mix, and boil for 15 to 20 min. Add methyl orange TS, and neutralize the solution with ammonium hydroxide. Add 1 g of ammonium nitrate crystals, stir to dissolve, and cool. Add 15 mL of ammonium molybdate TS, with stirring, and stir vigorously for 3 min, or allow to stand with occasional stirring for 10 to 15 min. Filter the contents of the beaker with suction through a 6- to 7-mm paper-pulp filter pad supported in a 25-mm porcelain disk. The filter pad should be covered with a suspension of infusorial earth. After the contents of the beaker have been transferred to the filter, wash the beaker with five 10-mL portions of a 1 in 100 solution of sodium or potassium nitrate, passing the washings through the filter, then wash the filter with five 5-mL portions of the wash solution. Return the filter pad and the precipitate to the beaker, wash the funnel thoroughly with water into the beaker, and dilute to about 150 mL. Add 0.1 N sodium hydroxide from a buret until the yellow precipitate is dissolved, then add 5 to 8 mL in excess. Add phenolphthalein TS, and titrate the excess alkali with 0.1 N nitric acid. Finally, titrate with 0.1 N sodium hydroxide to the first appearance of the pink color. The difference between the total volume of 0.1 N sodium hydroxide added and the volume of nitric acid required represents the volume, V, in mL, of 0.1 N sodium hydroxide consumed by the phosphomolybdate complex. Calculate the quantity, in mg, of $Na_5P_3O_{10}$ in the sample taken by the formula

$$0.533 \times 25V.$$

Arsenic A solution of 1 g in 35 mL of water meets the requirements of the Arsenic Test, Appendix IIIB.

Fluoride Determine on a 2-g sample as directed in Method IV under the Fluoride Limit Test, Appendix IIIB, using Buffer Solution A and 0.1 mL of Fluoride Standard Solution.

Heavy Metals A solution of 2 g in 25 mL of water meets the requirements of the Heavy Metals Test, Appendix IIIB, using 20 µg of lead ion (Pb) in the control (Solution A).

Insoluble Substances Dissolve 10 g in 100 mL of hot water, and filter through a tared filtering crucible. Wash the insoluble residue with hot water, dry at 105° for 2 h, cool, and weigh.

Lead ~~A solution of 1 g in 20 mL of water meets the requirements of the Lead Limit Test, Appendix IIIB, using 5 µg of lead ion (Pb) in the control~~ A 10-g sample meets the requirements of the APDC Extraction Method for Lead, Appendix IIIB.

Packaging and Storage Store in tight containers.