# SODIUM TRIPOLYPHOSPHATE

## PRODUCT IDENTIFICATION
- **CAS NO.** 7758-29-4
- **EINECS NO.** 231-838-7
- **FORMULA** Na$_5$P$_3$O$_{10}$
- **MOL WT.** 367.86
- **H.S. CODE** 2835.31

## SYNTHESIS
Sodium tripolyphosphate is obtained by reacting phosphoric acid with a sodium alkali (usually sodium carbonate). It can also be made by mixing sodium carbonate with three parts of phosphoric acid.

## CLASSIFICATION
**PHYSICAL AND CHEMICAL PROPERTIES**
- **PHYSICAL STATE:** white powder
- **MELTING POINT:** 620°C (Decomposes)
- **BOILING POINT:**
- **SPECIFIC GRAVITY:** > 1.5
- **SOLUBILITY IN WATER:** 20% at 25°C
- **pH:** 9.7 - 9.8 (1% solution)
- **VAPOR DENSITY:**
- **AUTOIGNITION:**
- **NFPA RATINGS:**
- **REFRACTIVE INDEX:**
- **FLASH POINT:**
- **STABILITY:** Stable under ordinary conditions

## APPLICATIONS
The alkaline phosphates offer detergency activity in combination with properties of sequestration, dispersion, and buffering ability. STPP is used in water softening, industrial cleaners, food uses, detergent, emulsifier of oil and grease, peptizing agent, deflocculating agent in oil well, sequester in cotton boiling.

## SALES SPECIFICATION
### H GRADE
- **APPEARANCE:** free flowing white powder
- **PURITY:** 96.0% min
- **P$_2$O$_5$:** 57.0% min
- **WATER INSOLUBLES:** 0.1% max
- **IRON as Fe:** 0.007% max
- **WHITENESS:** 90.0% min
- **HEAVY METAL as Pb:** 0.003% max
- **ARSENIC as As:** 0.001% max
- **pH VALUE:** 9.2 - 10.0

### G GRADE
- **APPEARANCE:** free flowing white powder
- **PURITY:** 90.0% min
- **P$_2$O$_5$:** 56.0% min
**GENERAL DESCRIPTION OF PHOSPHORIC ACID**

Phosphoric acid is a phosphorus-containing inorganic acid made up of phosphorus, oxygen, and hydrogen. In a broadened term, it includes the monomeric (orthophosphoric acid), dimeric (pyrophosphoric acid), and polymeric (metaphosphoric acid) forms of the acid. Phosphoric acid commonly indicates the monomeric form orthophosphoric acid. On heating to about 225 °C, it dehydrates to form pyrophosphoric acid and to metaphosphoric acid \( (2HPO_4 = P_2O_5 \cdot H_2O) \) at higher temperatures. Pyrophosphates are salts of pyrophosphoric acid and metaphosphates are salts of metaphosphoric acid. Two molecules of orthophosphoric acid are formed when three molecules of water are added to one molecule of phosphorus pentoxide \( (2H_3PO_4 = P_2O_5 \cdot 3H_2O) \). The pyrophosphates are formed by the loss of 1 molecule of water from 2 moles of an orthophosphate. Pure orthophosphoric acid is a crystalline solid; melting point 42 °C; soluble in alcohol, and very soluble in water.

Phosphoric Acid violently polymerizes under the influence of azo compounds, epoxides and other polymerizable compounds. It forms toxic fumes of phosphorous oxides when combusted. It is a medium strong acid and attacks metals to release flammable hydrogen gas. Decomposition may occur on contacting with alcohols, aldehydes, cyanides, ketones, phenols, esters, sulfides, halogenated organics compounds.

Phosphoric acid is essential in the body organism as the constituent of bones and teeth as well as in many metabolic process of carbohydrate, fat and protein. Phosphoric acid is abundant in natural foods as the form of free phosphoric acid itself or as the mineral salts (potassium, sodium or calcium). Phosphoric acid is used to acidify foods and beverages. But the continuous and excessive absorption of beverages particularly Coca Cola and Pepsi Cola which contain large amount of phosphoric acid should be limited. Phosphate excretion takes place in the form of calcium phosphate. The excessive amounts of phosphoric acid in the body may cause calcium deficiency which causes poor teeth and weak bone density (osteoporosis). Phosphoric acid is used in pharmaceutical preparations as a solvent and as a gastric acidifier orally. Phosphoric acid is important raw material in industrial field. It is a tribasic acid (having three replaceable hydrogen atoms) which can forms phosphates with either one, two, or all three of the hydrogens by replacing with some other positive ion. It is used in making fertilizers, electrolytes, electroplating and derusting solutions. It is used in the manufacture of industrial cleaning products, other inorganic and organic phosphoric...
chemicals, foundry resins, paints, enamels and refractory, antifreeze productions, and textile process materials. It is used in water treatment. Food grade phosphoric acid is used; as an acidulation in soft drink (particularly cola); pH control in imitation jellies; nutrient in production of yeast; bacteria growth control in selected processed foods; flocculating agent for clarification of sugar juices after liming process.

- Phosphorous acid: a diprotic acid which contains one hydrogen bonded directly to the central phosphorus atom and two hydrogens bonded to oxygen
- Phosphite: any salt, ester or anion of phosphorous acid
- Phosphate: any salt, ester or anion of phosphoric acid
- Phosphide: any binary compound of phosphorus with another element or radical
- Phosphine: binary compound of phosphorus with hydrogen or organic compounds derived from this

One of the important phosphates is calcium phosphate, Ca₃(PO₄)₂. The most important phosphorus fertilizer is monobasic calcium phosphate, called superphosphate [Ca(H₂PO₄)₂], derived by treating rock phosphate with sulfuric acid (or phosphoric acid). Superphosphate is soluble in water and acts as a carrier of phosphorus needed by plants. Dibasic calcium phosphate (CaH₂PO₄) is used in pharmaceuticals, animal feeds, and toothpastes. Tribasic calcium phosphate, [Ca₃(PO₄)₂] is used as a fertilizer and as a plastics stabilizer. Other important inorganic phosphates include ammonium phosphate [(NH₄)₂HPO₄] used as a fertilizer and fire retardant; trisodium phosphate used in detergents and for softening water; mono and disodium phosphate used for dispersion, sequestration, scale inhibition and preparing baking powders. The salt forms of phosphate polymers is used as a sequestering agent. As phosphate polymers themselves are hydrated in water at high temperature or high pH, and thereby revert to a more simple and stable phosphate form, which can no longer sequester metal ions. Industrial phosphates are used in many applications including dispersion, sequestration and scale inhibition. Detergent application is important also, with products such as sodium tripolyphosphate being key ingredients in detergents. Phosphates are used in a wide range of food products to perform several functions like retention of natural fluids in the muscle that would otherwise be lost in the aging, cooking, or freeze-thaw processes. Polyphosphates also act in solubilization of myofibrillar proteins that aid in the binding of meat particles. Their presence results in stabilised texture, flavour, and colour.

Mono and dibasic phosphate esters produced by the reaction of either alcohols, alcohol ethoxylates or phenyl ethoxylates with polyphosphoric acid or phosphorous pentoxide are anionic surfactants which have the main feature of the stability in alkaline conditions over other surfactants. They have a wide range of properties including outstanding wetting, emulsification, lubrication, coupling activity and detergency. They exhibit the properties of anti-wear and corrosion inhibition either as free esters or in the forms of metal and amine salts. They are used in:

- Heavy duty alkaline cleaning products
- Laundry Detergents
- Emulsion polymerisation
- Textile auxiliaries
- Acid cleaners
- Metal working fluids
- Emulsifiers
- Wetters
- Dispersants
Phosphoric acid alkyl esters are also used as alkylation agent for nitrogen heterocyclic compounds and as catalysts to produce phenolic and urea resins. They are used flame retarding plasticizers for cellulose esters, lacquers, plastic and vinyl resins as well as as dispersing agents in plastisols. They are used as solvents in liquid-liquid extractants or separation agent of metals. They are is used as heat exchange media and as pigment grinding assistants and antifoam agents.