

Trisodium Phosphate

Document History

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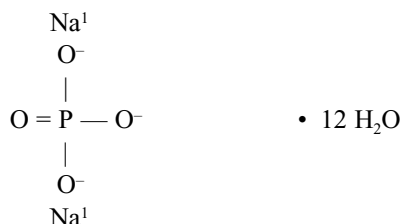
I. IDENTIFICATION^(1,2)

Chemical Name: Trisodium phosphate; phosphoric acid; trisodium salt; trisodium ortho-phosphate

Synonyms: Phosphoric acid, trisodium salt; Sodium orthophosphate; Sodium phosphate; Sodium phosphate, tribasic; Trisodium orthophosphate; trisodium phosphate

CAS Number: 7601-54-9

Molecular Formula: $\text{Na}_3\text{PO}_4 \cdot 12 \text{H}_2\text{O}$



II. CHEMICAL AND PHYSICAL PROPERTIES^(1,3,4)

Physical State and Appearance: Colorless crystals

Odor Description and Threshold: Odorless

Molecular Weight: 163.94

Conversion Factors: Not applicable

Melting Point: 73.3°C – 76.7°C (163°F – 170°F)

Boiling Point: Not applicable

Vapor Pressure: Not applicable

Flammability limits: Not applicable

Specific Gravity: 1.62 at 20°C (68°F)

Solubility in Water:

25.8 g in 100 g at 20°C (68°F)

Stability: Loss of hydrate molecule at 100°C (212°F); when heated to decomposition it emits toxic fumes of Na_2O and PO_x

Reactivity and Incompatibilities: No data available.

III. USES

Trisodium phosphate (TSP) is used primarily in the dodecahydrate form as a controlled alkali source, mostly in the crystalline grade in hard surface cleaners, scouring agents, and other heavy duty cleaners. It is

also used in water softeners, mold inhibitors, removal of insecticide residue, paper manufacturing, and leather tanning.^(3,5)

IV. ANIMAL TOXICITY DATA

A. Acute Toxicity

1. Oral Toxicity

Rats: Crystalline trisodium phosphate was administered as a 10% aqueous solution to non-fasted Sprague-Dawley rats of both sexes; the acute oral LD_{50} was 4,100 mg/kg.⁽⁶⁾

2. Eye Irritation

Rabbits: Studies showed a corrosive effect when 0.1 mL (75 mg equivalent) of trisodium phosphate solution was placed in the conjunctival sac for 24 hr, however only a slight degree of irritation resulted when 0.1 mL (75 mg equivalent) of TSP solution was placed in the conjunctival sac of the rabbit eye for 1 min followed by washing. By the end of the 14-day observation period, all eyes had regained normal appearance.⁽⁶⁾

3. Skin Absorption

Rabbits LD_{50} : >7,940 mg/kg⁽⁶⁾

4. Skin Irritation

Studies indicate a mild degree of irritation when 0.5 g of finely ground crystalline trisodium phosphate moistened with water was held in continuous contact for 24 hr with intact and abraded rabbit skin, however TSP was not classed as a primary skin irritant.⁽⁶⁾

5. Skin Sensitization

No data available.

6. Inhalation Toxicity

1-hour LC_{50} (rats): > 2,100 mg/m³⁽¹¹⁾

7. Other Toxicity

Mice: LD₅₀, intraperitoneal = 430 mg/kg⁽⁶⁾

Rabbits: LD₁₀ intravenous = 1580 mg/kg⁽⁶⁾

In sows, retained enemas of a mixture of sodium biphosphate and sodium monophosphate caused a reduction in serum calcium at 1 g/kg and death at 4–6 g/kg.⁽⁸⁾

B. Subacute Toxicity

No data available.

C. Chronic Toxicity/Carcinogenicity

No data available.

D. Subchronic Toxicity

No data available.

E. Reproductive/Developmental Toxicity

No data available.

F. Genotoxicity

No data available.

G. Metabolism/Pharmacokinetics

In large doses, the primary systematic effect is a reduction in calcium ion (hypocalcemia) and precipitation of calcium phosphate in soft tissue.⁽⁹⁾ Excretion of absorbed phosphorous is mainly renal.⁽¹⁰⁾

V. HUMAN USE AND EXPERIENCE

The fatal dose in humans is reported to be about 50 g.⁽⁷⁾ If inhaled as an airborne mist or dust, trisodium phosphate might have a very irritating effect on the tissues of the upper respiratory tract and eyes but no quantitative reports were located.

VI. RATIONALE

Although of relatively low potential systemic toxicity, TSP is alkaline and the dust, therefore, has the potential to irritate eyes, skin and upper respiratory tract. For this reason, a 15-minute time-weighted average of 5 mg/m³ is recommended for the anhydride form of TSP. Phosphate metabolism and fate are well studied, and systemic effects are not expected other than by ingestion. No epidemiologic or other chronic occupational exposure experience studies or data were identified for TSP. The recommended WEEL is expected to be sufficient to protect against the irritating effects of TSP dust to the eyes and respiratory tract.

Available data do not support Skin or SEN notations.

VII. RECOMMENDED OEL

15-minute TWA (STEL) of 5 mg/m³

VIII. REFERENCES

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5. **Clayton, G.D., and F.E. Clayton (eds.):** *Patty's Industrial Hygiene and Toxicology*, 4th edition, Vol. IIA: Toxicology. New York: John Wiley & Sons, 1993. pp. 774–775.
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11. **IUCLID Dataset, Trisodium Orthophosphate:** Created by European Commission, Feb. 19th, 2000.

NOTE: The following databases were searched in developing this WEEL through December 2007:

MEDLINE
TOXLINE
HSDB
GENETOX
IRIS
ITER TOXSEEK
DART
IPCS/INCHEM
ATSDR
EPA