

## SODIUM ACID PYROPHOSPHATE

This dossier on sodium acid pyrophosphate presents the most critical studies pertinent to the risk assessment of these substances in their use in drilling muds. It does not represent an exhaustive or critical review of all available data. The information presented in this dossier was obtained primarily from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

Screening Assessment Conclusion – Sodium acid pyrophosphate is classified as a **tier 1** chemicals and requires a hazard assessment only.

### 1 BACKGROUND

Sodium acid pyrophosphate is an inorganic salt. It is widely used in food processing and in the United States, it is classified as generally recognized as safe (GRAS) for food use. In petroleum production, it can be used as a dispersant in oil well drilling muds.

Sodium acid pyrophosphate dissociates completely in aqueous media to sodium ions ( $\text{Na}^+$ ) and pyrophosphate ions ( $\text{P}_2\text{O}_7^{4-}$ ). The pyrophosphate anion is unstable in aqueous solution and hydrolyses into inorganic phosphate. Both sodium ions ( $\text{Na}^+$ ) and phosphate ions ( $\text{HPO}_4^{2-}$ ) are ubiquitous in the environment. Both ions are essential to all living organisms and their intracellular and extracellular concentrations are actively regulated. Neither sodium acid pyrophosphate nor its dissociated ions are expected to bioaccumulate. Sodium acid pyrophosphate is expected to be of low toxicity concern to aquatic organisms based on a similar compound.

### 2 CHEMICAL NAME AND IDENTIFICATION

**Chemical Name (IUPAC):** disodium dihydrogen (phosphonatoxy) phosphonate

**CAS RN:** 7758-16-9

**Molecular formula:**  $\text{H}_2\text{Na}_2\text{O}_7\text{P}_2$

**Molecular weight:** 221.94 g/mol

**Synonyms:** Disodium diphosphate, Disodium pytophosphate, Disodium dihydrogen pyrophosphate, Sodium acid pyrophosphate, Sodium polyphosphate, Polyphosphoric acids, sodium salts, Disodium acid pyrophosphate

### 3 PHYSICO-CHEMICAL PROPERTIES

Key physical and chemical properties for the substance are shown in Table 1.

**Table 1 Overview of the Physico-chemical Properties of sodium acid pyrophosphate**

Property	Value	Klimisch score	Reference
Physical state at 20°C and 101.3 kPa	white solid	1	ECHA

Property	Value	Klimisch score	Reference
Melting Point	> 450 °C (pressure not provided)	1	ECHA
Boiling Point	No data as the substance is a solid which melts above 300°C	-	ECHA
Density	2630 kg/m <sup>3</sup> @ 22°C	1	ECHA
Vapour Pressure	0 Pa @ 20 °C	1	ECHA-
Partition Coefficient (log K <sub>ow</sub> )	No data as the substance is a solid inorganic	-	ECHA
Water Solubility	170 g/l @ 20 °C	1	ECHA

#### 4 DOMESTIC AND INTERNATIONAL REGULATORY INFORMATION

A review of international and national environmental regulatory information was undertaken (Table 2). This chemical is listed on the Australian Inventory of Chemical Substances – AICS (Inventory). No conditions for its use were identified. No specific environmental regulatory controls or concerns were identified within Australia and internationally for sodium acid pyrophosphate.

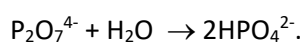
NICNAS has assessed sodium acid pyrophosphate in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to human health or the environment<sup>1</sup>.

**Table 2 Existing International Controls**

Convention, Protocol or other international control	Listed Yes or No?
Montreal Protocol	No
Synthetic Greenhouse Gases (SGG)	No
Rotterdam Convention	No
Stockholm Convention	No
REACH (Substances of Very High Concern)	No
United States Endocrine Disrupter Screening Program	No
European Commission Endocrine Disruptors Strategy	No

#### 5 ENVIRONMENTAL FATE SUMMARY

As an inorganic substance, sodium acid pyrophosphate is expected to disassociate completely in aqueous media to sodium ions (Na<sup>+</sup>) and pyrophosphate ions (P<sub>2</sub>O<sub>7</sub><sup>4-</sup>). The pyrophosphate anion is unstable in aqueous solution and hydrolyses into inorganic phosphate:



<sup>1</sup> <https://www.industrialchemicals.gov.au/chemical-information/search-assessments?assessmentcasnumber=7758-16-9%2C+>

Both (Na<sup>+</sup>) and phosphate ions (HPO<sub>4</sub><sup>2-</sup>) are ubiquitous in the environment. Both ions are essential to all living organisms and their intracellular and extracellular concentrations are actively regulated (Ganong, 1995). Neither sodium acid pyrophosphate nor its dissociated ions are expected to bioaccumulate.

## 6 ENVIRONMENTAL EFFECTS SUMMARY

### A. Summary

Sodium acid pyrophosphate is of low toxicity concern to aquatic and terrestrial organisms. Details are provided below.

### B. Aquatic Toxicity

#### Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on sodium acid pyrophosphate.

**Table 3 Acute Aquatic Toxicity Studies on Sodium Acid Pyrophosphate**

Test Species	Endpoint	Results (mg/L)	Klimisch score	Reference
<i>Freshwater fish</i>	96-hour LC <sub>50</sub>	100 mg/L <sup>1</sup>	1	ECHA
<i>Daphnia magna</i>	48-hour EC <sub>50</sub>	100 mg/L <sup>1</sup>	1	ECHA
<i>Desmodemus subspicatus</i>	72 hour EC <sub>10</sub>	100 mg/L <sup>1</sup>	1	ECHA

1 – based on read across to phosphoric acid, potassium salt (2:3), dihydrate (CAS No. 66922-99-4)

#### Chronic Studies

No chronic studies were identified.

### C. Terrestrial Toxicity

Table 4 lists the results of terrestrial toxicity studies conducted on sodium acid pyrophosphate.

**Table 4 Terrestrial Toxicity Studies on Sodium acid pyrophosphate\***

Test Species	Endpoint	Results (mg/kg soil dw)	Klimisch score	Reference
<i>Eisenia foetida</i>	14-day LC <sub>50</sub>	> 3,500	2	ECHA

\*Study used test material potassium hydrogen phosphate (CAS No. 7778-77-0)

## **7 CATEGORISATION AND OTHER CHARACTERISTICS OF CONCERN**

### **A. PBT Categorisation**

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (DEWHA, 2009; ECHA, 2008).

Sodium acid pyrophosphate is an inorganic salt that dissociates to its respective cations and anions in aqueous solutions. Biodegradation is not applicable to these inorganic ions. For the purposes of this PBT assessment, the persistence criteria are not considered applicable to this inorganic salt.

Sodium and phosphate ions are essential to all living organisms and their intracellular and extracellular concentrations are actively regulated. Therefore, sodium acid pyrophosphate is not expected to bioaccumulate.

Both chronic and acute aquatic toxicity data are  $>1$  mg/L. Thus, sodium acid pyrophosphate does not meet the screening criteria for toxicity.

The overall conclusion is that sodium acid pyrophosphate is not a PBT substance.

### **B. Other Characteristics of Concern**

No other characteristics of concern were identified for sodium acid pyrophosphate.

## 8 SCREENING ASSESSMENT

Chemical Name	CAS No.	Overall PBT Assessment <sup>1</sup>	Chemical Databases of Concern Assessment Step		Persistence Assessment Step		Bioaccumulative Assessment Step	Toxicity Assessment Step			Risk Assessment Actions Required <sup>3</sup>
			Listed as a COC on relevant databases?	Identified as Polymer of Low Concern	P criteria fulfilled?	Other P Concerns	B criteria fulfilled?	T criteria fulfilled?	Acute Toxicity <sup>2</sup>	Chronic Toxicity <sup>2</sup>	
Sodium acid pyrophosphate	7758-16-9	Not a PBT	No	No	NA	No	No	No	1	1	1

**Footnotes:**

1 - PBT Assessment based on PBT Framework.

2 - Acute and chronic aquatic toxicity evaluated consistent with assessment criteria (see Framework).

3 - Tier 1 - Hazard Assessment only.

**Notes:**

NA = not applicable

PBT = Persistent, Bioaccumulative and Toxic

B = bioaccumulative

P = persistent

T = toxic

## 9 REFERENCES, ABBREVIATIONS AND ACRONYMS

### A. References

Department of the Environment, Water, Heritage and the Arts (DEWHA). (2009). Environmental risk assessment guidance manual for industrial chemicals, Department of the Environment, Water, Heritage and the Arts, Commonwealth of Australia.

ECHA. ECHA REACH database: <https://echa.europa.eu/information-on-chemicals/registered-substances>

European Chemicals Agency (ECHA). (2008). Guidance on Information Requirements and Chemical Safety Assessment, Chapter R11: PBT Assessment, European Chemicals Agency, Helsinki, Finland.

Ganong, W.F. (1995). Review of Medical Physiology, 17<sup>th</sup> Edition, Appleton & Lange, Norwalk, Connecticut, USA.

Klimisch, H.J., Andreae, M., and Tillmann, U. (1997). A systematic approach for evaluating the quality of experimental and toxicological and ecotoxicological data. Regul. Toxicol, Pharmacol. 25:1-5.

### B. Abbreviations and Acronyms

°C	degrees Celsius
AICS	Australian Inventory of Chemical Substances
COC	constituent of concern
DEWHA	Department of the Environment, Water, Heritage and the Arts
dw	dry weight
EC	effective concentration
ECHA	European Chemicals Agency
EU	European Union
g/L	grams per litre
IUPAC	International Union of Pure and Applied Chemistry
kg/m <sup>3</sup>	kilograms per cubic metre
kPa	kilopascal
LC	lethal concentration
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
NOEC	no observed effective concentration
PBT	Persistent, Bioaccumulative and Toxic

PEC	Predicted exposure concentrations
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
SGG	Synthetic Greenhouse Gases