

SODIUM POLYNAPHTHALENE SULFONATE

This dossier on sodium polynaphthalene sulfonate presents the most critical studies pertinent to the risk assessment of sodium polynaphthalene sulfonate in its use as a cement additive chemical. It does not represent an exhaustive or critical review of all available data. Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch *et al.*, 1997).

Screening Assessment Conclusion – Sodium polynaphthalene sulfonate is classified as a **tier 1** chemical and requires a hazard assessment only.

1 BACKGROUND

Sodium polynaphthalene sulfonate (SPNS) functions as an emulsion stabilizer, surfactant – dispersing agent, and a surfactant – hydrotrope in cosmetic products. It is used as a raw material in the production of admixtures for the construction industry and is one of the basic ingredients for formulation of chemical admixtures for concrete and mortars. It is defined as the sodium salt of the product obtained by the condensation polymerization of 2-naphthalene sulfonic acid and formaldehyde.

2 CHEMICAL NAME AND IDENTIFICATION

Chemical Name (IUPAC): Naphthalenesulfonic acid, sodium salt, polymer with formaldehyde

CAS RN: 9008-63-3

Molecular formula: $(C_{10}H_8O_3S.CH_2O.Na)_x$ [This substance is a polymer.]

Molecular weight: Unknown

Synonyms: Sodium polynaphthalene sulfonate; naphthalenesulfonic acid, sodium salt, polymer with formaldehyde; sodium naphthalenesulfonate-formaldehyde copolymer; naphthalenesulfonic acid sodium salt/formaldehyde polymer; formaldehyde/naphthalenesulfonic acid

3 PHYSICO-CHEMICAL PROPERTIES

According to Hampshire Chemical Corp. (1995), SPNS is made by reacting naphthalene with sulfuric acid under conditions of heat and pressure. Formaldehyde and water are then added to produce the acid polymer under the same conditions of heat and pressure. Caustic is added to the acid polymer resulting in the final product (CIR, 2003).

SPNS is tan or amber in powdered form and brown in liquid form. It is completely soluble with a density of 400 – 700 kg/m³. The substance has a percent (%) volatility of 3 % to 7 % water (CIR, 2003).

4 DOMESTIC AND INTERNATIONAL REGULATORY INFORMATION

A review of international and national environmental regulatory information was undertaken (Table 1). 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 polynaphthalene sulfonate.

NICNAS has assessed 2-naphthalenesulfonic acid, polymer with formaldehyde, sodium salt in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to human health or the environment¹.

Table 1 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 a class, the lower molecular weight/bioavailable non-polymeric ammonium, potassium and sodium naphthalenesulfonate formaldehyde condensate surfactants have the following physicochemical profile:

- Non-volatile
- High melting point
- Not lipophilic, but with increasing log K_{ow} with increasing methylation, going from -0.32 for naphthalenesulfonic acids, reaction products with formaldehyde, sodium salts (CAS No. 91078-68-1) to 0.78 for methylnaphthalene sulfonate (no CAS No.)
- Binds tightly to soil
- Oxidative degradation within 8 hours
- Biodegradable with affinity for water and soil compartments (USEPA, 2017)

6 ENVIRONMENTAL EFFECTS SUMMARY

No data are available for this polymeric substance. In lieu of this lack of information, data are taken from the monomeric subunit, sodium naphthalene-2-sulphonate (CAS RN 532-02-5) though it should be noted that toxicity is likely overestimated when read across from the monomer to the polymer.

¹ <https://www.industrialchemicals.gov.au/chemical-information/search-assessments?assessmentcasnumber=36290-04-7>

A. Aquatic Toxicity

Acute toxicity of sodium naphthalene-2-sulphonate to freshwater fish and invertebrates was estimated using USEPA's ECOSAR v1.00 predictor. The 96 hr LC₅₀ for freshwater fish was calculated to be 105,000 mg/L [KI Score = 2](ECHA) while the 48 hour EC₅₀ for the invertebrate Daphnia Magna was estimated to be 49421.05 mg/L [KI Score = 2](ECHA). Based on the QSAR prediction done using the Danish (Q)SAR Database, the 72 hour EC₅₀ for the alga, Pseudokirchnerella subcapitata was estimated to be 4767.52 mg/L [KI Score = 2](ECHA). The 100 hr EC₅₀ was determined to be 135 mg/L for Daphnia magna [KI Score=2](ECHA).

B. Terrestrial Toxicity

No data are available.

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 polynaphthalene sulfonate is a polymer; it is not expected to be biodegradable. Thus, it meets the criteria for persistence.

Sodium polynaphthalene sulfonate is not expected to bioaccumulate due to its low potential for bioavailability because of its expected molecular weight and size and low water solubility.

No aquatic toxicity studies are available for sodium polynaphthalene sulfonate. The acute E(L)C50 values for read-across substance sodium naphthalene 2-sulphonate are >1 mg/L in fish, invertebrates and algae. Therefore, it does not meet the screening criteria for toxicity.

The overall conclusion is that sodium polynaphthalene sulfonate is not a PBT substance.

B. Other Characteristics of Concern

No other characteristics of concern were identified for sodium polynaphthalene sulfonate.

8 SCREENING ASSESSMENT

Chemical Name	CAS No.	Overall PBT Assessment ¹	Chemical Databases of Concern Assessment Step		Persistence Assessment Step		Bioaccumulative Assessment Step	Toxicity Assessment Step			Risk Assessment Actions Required ³
			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 ²	Chronic Toxicity ²	
Sodium Polynaphthalene Sulfonate	9008-63-3	Not a PBT	No	No	Yes	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 based on a read across to the monomeric subunit, sodium naphthalene-2-sulphonate.

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.

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.

United States Environmental Protection Agency [USEPA]. (2017). Naphthalenesulfonate Formaldehyde Condensates Potassium Salts; Human Health Risk Assessment and Ecological Effects Assessment to Support Proposed Exemption from the Requirement of a Tolerance When Used as an Inert Ingredient in Pesticide Formulations. Office of Pesticide Programs Registration Division. May 10, 2017

B. Abbreviations and Acronyms

AICS	Australian Inventory of Chemical Substances
COC	constituent of concern
DEWHA	Department of the Environment, Water, Heritage and the Arts
ECHA	European Chemicals Agency
ECOSAR	Ecological Structure Activity Relationships (ECOSAR v1) Class Program, Risk Assessment Division of the Office of Pollution Prevention and Toxics, U.S. Environmental Protection Agency (U.S. EPA/OPPT).
EU	European Union
IUPAC	International Union of Pure and Applied Chemistry
PBT	Persistent, Bioaccumulative and Toxic
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
SGG	Synthetic Greenhouse Gases
QSAR	Quantitative Structure Activity Relationship