SODIUM LIGNOSULFONATE

This dossier on sodium lignosulfonate presents the most critical studies pertinent to 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 lignosulfonate is classified as a **tier 1** chemical and requires a hazard assessment only.

1 BACKGROUND

Sodium lignosulfonate (wood pulp) is the extract of bamboo pulping process, which is made by concentrating, modifying, spraying and drying. Sodium lignosulfonate (CAS 8061-51-6) is light yellow (brown) free flowing powder, and easy to dissolve in water. The chemical property of the product is stable, and the long-term sealed storage cannot be decomposed. Lignin series product is a kind of surfactant, a variety of products can be produced by modification, processing and compounding. These products are mainly used for resin, rubber, dyes, pesticides, ceramics, cement, asphalt, feed, water treatment, water coal slurry, concrete, refractory materials, oil drilling, compound fertilizer, smelting, casting and adhesive. It has been proven by experiment that lignosulfonate is very effective in preventing sandy soil and can be used as a desert fixed sand agent.

As a concrete water-reducing agent sodium lignosulfonate belongs to anionic surface active substance, has adsorption and dispersion effect on cement, and can improve various physical properties of concrete. Sodium lignosulfonate (CAS 8061-51-6) can reduce water consumption by more than 13%, improve the workability of concrete and greatly reduce the hydration heat at the early stage of cement hydration. It can be compounded into early strength agent, retarder, antifreeze, pumping agent, etc. In drilling it can be used as a diluting dispersant and viscosity reducer which can improve petroleum fluidity thereby reducing energy consumption.

2 CHEMICAL NAME AND IDENTIFICATION

Chemical Name (IUPAC): Sodium lignosulfonate

CAS RN: 8061-51-6

Molecular formula: Not applicable.

Molecular weight: Unknown

Synonyms: Sodium lignosulfonate; lignosulfonic acid, sodium salt; lignin sodium sulfonate

3 PHYSICO-CHEMICAL PROPERTIES

Sodium lignosulfonate is water soluble (>500 g/L) and has an average molecular weight of 10,000 g/mol (FR, 2005).

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 lignosulfonate.

NICNAS has assessed sodium hydroxide in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to human health[1] .

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

No specific data could be located on the environmental fate/transport of sodium lignosulfonate. The United States Environmental Protection Agency (USEPA) reviewed the environmental fate and environmental hazards of various lignosulfonate chemicals, including sodium lignosulfonate, for a proposed rule to establish 44 tolerance exemptions for residues of these substances (FR, 2005). The USEPA determined “that the various salts of lignosulfonic acid are soluble to very highly water soluble depending on the cation. Once in water, dissociation of the cation is expected depending on pH. These lignosulfonates are not expected to be mobile in terrestrial environments, moving equally with the water and sediment phase to surface water. Ground water migration is not likely. Once in water, the dissociated cation and anion are likely to remain in dissolution. The available information suggest that lignosulfonates may be persistent in aquatic environment of low microbial activity and much less persistent in environments with ample microbial activity…though the time for complete aerobic degradation is predicted to be months, the lignosulfonates are strongly absorbed to soils and sediments due to their high-molecular weights.” Based on the USEPA assessment, it is concluded that sodium lignosulfonate would meet the EU screening criteria for persistence. However, natural mechanisms exist that degrade these polymers and they are considered to be of low risk for the environment.

Due to its high-molecular weight, sodium lignosulfonate is not expected to be bioavailable to environmental receptors. This is supported by pharmacokinetic data on calcium lignosulfonate

[1] https://www.industrialchemicals.gov.au/chemical-information/search-assessments?assessmentcasnumber=8061-51-6%2C+

which showed that it is poorly absorbed from the gastrointestinal tract of rats (Beck and Rossi, 2005). Thus, it is not expected to bioaccumulate.

6 ENVIRONMENTAL EFFECTS SUMMARY

A. Summary

Sodium lignosulfonate is not expected to bioaccumulate due to its low potential for bioavailability because of its molecular weight and size. No aquatic toxicity studies are available for sodium lignosulfonate. It is expected to be a low concern of toxicity to aquatic organisms because of its low potential for bioavailability.

B. Aquatic Toxicity

Limited information is available. SDS is not inherently toxic to algae and invertebrates. It has low toxicity to fish (Golden orfe (*Leuciscud idus*)) with a reported LC_{50} value 1,400 – 2,000 mg/L (Hamburger et al., 1977).

C. 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).

Based on the assessment by the USEPA (FR, 2005), sodium lignosulfonate meets the criteria for persistence.

Sodium lignosulfonate is not expected to bioaccumulate due to its low potential for bioavailability because of its molecular weight and size. Thus, it does not meet the criteria for bioaccumulation.

Limited aquatic toxicity studies are available for sodium lignosulfonate. It is expected to be a low concern of toxicity to aquatic organisms based on reported LC_{50} values.

The overall conclusion is sodium lignosulfonate is not a PBT substance.

B. Other Characteristics of Concern

No other characteristics of concern were identified for sodium lignosulfonate.

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 Lignosulfonate	8061-51-6	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.

Notes:

NA = not applicable

PBT = Persistent, Bioaccumulative and Toxic

B = bioaccumulative

P = persistent

T = toxic

9 REFERENCES, ABBREVIATIONS AND ACRONYMS

A. References

Beck, M., and Rossi, B. (2005). Absorption, distribution and excretion of tritium labeled lignosulfonate after single oral administration to rats. Report No. 2500147, DSM Nutritional Products Ltd.; cited in EFSA (2010).

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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
EU	European Union
g/L	grams per litre
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
USEPA	United States Environmental Protection Agency