CELLOPHANE

This dossier on cellophane presents the most critical studies pertinent to the risk assessment of its use in drilling muds and as a cement additive chemical. 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 – Cellophane is classified as a **tier 1** chemical and requires a hazard assessment only.

1 BACKGROUND

Cellophane is a thin, transparent sheet made of regenerated cellulose. Its low permeability to air, oils, greases, bacteria and water makes it useful for food packaging. Cellophane is highly permeable to water vapour, but may be coated with nitrocellulose lacquer to prevent this. As well as food packaging, cellophane is used in transparent pressure-sensitive tape, tubing and many other similar applications. Unlike many other similar materials, cellophane is biodegradable.

Cellophane is produced from cellulose from wood, cotton, hemp or other sources. It is dissolved in alkali and carbon disulfide to make a solution called viscose, which is then extruded through a slit into a bath of dilute sulfuric acid and sodium sulfate to reconvert the viscose into cellulose. The film is then passed through several more baths, one to remove sulfur, one to bleach the film, and one to add softening materials such as glycerin to prevent the film from becoming brittle.

A similar process, using a hole (a spinneret) instead of a slit, is used to make a fibre called rayon. Chemically, cellophane, rayon and cellulose are polymers of glucose; they differ structurally rather than chemically. "Cellophane" is a generic term in some countries, while in other countries it is a registered trademark.[1]

2 CHEMICAL NAME AND IDENTIFICATION

Chemical Name (IUPAC): diiron(3+) trioxidandiide

CAS RN: 9005-81-6

Molecular formula: Unspecified

Molecular weight: Unspecified

Synonyms: None

[1] Background information as cited in Wikipedia (https://en.wikipedia.org/wiki/Cellophane#Material_properties) and referenced from USEPA U.S. Environmental Protection Agency. CompTox Chemicals Dashboard. https://comptox.epa.gov/dashboard/DTXSID8050491 (accessed March 03, 2021), Cellophane

3 PHYSICO-CHEMICAL PROPERTIES

Cellophane is a polymeric cellulose film. Cellulosic separators in batteries such as cellophane offer the benefits of very small pore sizes, but are not stable in the oxygen atmosphere that results from charging the cell (Cairns, 2009). The density of cellophane is equal to 1,420 kg/m³ (NIST). Cellophane is transparent, strong, flexible and highly resistant to grease, oil and air. The base cellulose film is modified by softeners, flame-resisting materials and dyes, also by coating with other materials. On exposure to heat the untreated film loses strength at 149°C, decomposes at 176-204°C, does not melt, burns readily and is not self-extinguishing (Miles and Briston, 1965).

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 cellophane.

NICNAS has assessed cellulose (CAS No. 9004-34-6) in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to human health or the environment[2] .

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

Cellophane, as a cellulosic polymer, is expected to degrade in the environment. It is largely transparent to UV light, but prolonged exposure to sunlight weakens viscose rayon fibers. A 6-hour exposure of unstabilized viscose to UV light leads to a loss in in strength of about 4% (McKeen, 2019).

Its polymeric nature precludes bioaccumulation, biomagnification and sorption to sediments or soils. It is not expected to pose a toxicological hazard to environmental receptors.

[2] https://www.industrialchemicals.gov.au/chemical-information/search-assessments?assessmentcasnumber=9004-34-6

6 ENVIRONMENTAL EFFECTS SUMMARY

A. Summary

Cellophane is expected to be of low toxicity concern to aquatic and terrestrial organisms.

B. Aquatic Toxicity

Acute Studies

No acute toxicity studies are available.

Chronic Studies

No chronic toxicity studies are available.

C. Terrestrial Toxicity

No terrestrial toxicity studies 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).

Cellophane is an organic polymer that is likely to degrade over time. For the purposes of this PBT assessment, cellophane is not considered persistent criteria and therefore, the persistent criteria are not met.

Cellophane is not expected to be bioaccumulative or bioconcentrate and therefore does not meet the criteria for bioaccumulation.

Cellophane is not expected to be of a substantial toxicological concern to environmental receptors. Thus, cellophane does not meet the screening criteria for toxicity.

The overall conclusion is that cellophane is not a PBT substance.

B. Other Characteristics of Concern

No other characteristics of concern were identified for cellophane.

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]	
Cellophane	9005-81-6	Not a PBT	No	No	No	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

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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.

McKeen, Laurence W. (2019). Chapter 13: Renewable Resource, Sustainable and Biodegradable Polymers. The Effect of UV Light and Weather on Plastics and Elastomers (Fourth Edition),William Andrew Publishing, 2019, Pages 425-438.

Miles DC and Briston JH. (1965). Polymer technology. New York : Chemical Publishing Co. Inc. 444 p.

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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
ECHA	European Chemicals Agency
EU	European Union
IUPAC	International Union of Pure and Applied Chemistry
kg/m^3	kilograms per cubic metre
PBT	Persistent, Bioaccumulative and Toxic
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
SGG	Synthetic Greenhouse Gases