Australian Government
Department of Health, Disability and Ageing
Australian Industrial Chemicals Introduction Scheme

Sulfuric acid, compd. with graphite (1:?)

Assessment statement (CA10026)

23 June 2025

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AICIS assessment (CA10026)

Chemical in this assessment

Name	CAS registry number
Sulfuric acid, compd. with graphite (1:?)	12777-87-6

Reason for the assessment

An application for an assessment certificate under section 31 of the *Industrial Chemicals Act 2019* (the Act).

Certificate application type

AICIS received the application in a Health Focus type.

Defined scope of assessment

The chemical has been assessed:

- as imported into Australia at up to 6 tonnes/year in finished end use products
- for use as a component of flame retardant adhesives and sealants at up to 20% concentration by professional workers only

Summary of assessment

Summary of introduction, use and end use

The assessed chemical has a functional use as a flame retardant. It will not be manufactured, reformulated or re-packaged in Australia. The assessed chemical will be imported into Australia for commercial application at up to 6 tonnes/year in 244 mL or 310 mL cartridges. It will be imported as a component of finished end use products at up to 20% concentration in liquid or paste form, for use in the construction industry as a flame retardant sealant. The liquid formulation is a component of a 2-part product, which forms a foam filler material when the components are mixed upon application.

Products containing the assessed chemical will be used at construction sites by professional workers only and will not be available to the public. The products will be applied by caulking gun or similar dispenser to fill gaps around pipes and electrical cabling during construction operations.

Human health

Summary of health hazards

The submitted toxicological data on the assessed chemical (see **Supporting information**) indicate that the chemical is:

- of low acute oral and dermal toxicity
- slightly irritating to the skin and eyes but the data does not support classification
- not expected to cause serious systemic health effects following repeated oral exposure
- not considered to have genotoxic potential

No inhalation or skin sensitisation data were provided for the assessed chemical. Workplace monitoring of sensitising effects in manufacturing workers handling the assessed chemical indicates that it does not have skin sensitisation potential.

Hazard classifications relevant for worker health and safety

Based on the data provided by the applicant, the assessed chemical does not satisfy the criteria for classification according to the *Globally Harmonized System of Classification and Labelling of Chemicals* (GHS) (UNECE 2017) for hazard classes relevant for worker health and safety as adopted for industrial chemicals in Australia.

Summary of health risk

Public

The products containing the assessed chemical will not be available for use by the public. When introduced and used in the proposed manner, it is unlikely that the public will be exposed to the chemical.

This assessment does not identify any risks to public health that require specific risk management measures.

Workers

Potential exposure of workers to the assessed chemical may occur during end use applications. While the exposure to the assessed chemical will be mainly dermal, ocular and inhalation exposures may also occur if dust is generated during dismantling or mechanical processing of cured products.

No risks were identified for workers during these processes that require specific risk management measures. In the absence of inhalation and sensitisation data, control measures to minimise exposure are recommended (see **Means for managing risk**).

Environment

Summary of environmental hazard characteristics

As the assessed chemical is inorganic, it is excluded from categorisation under the *Australian Environmental Criteria for Persistent, Bioaccumulative and/or Toxic Chemicals* (DCCEEW 2022).

Environmental hazard classification

Based on the ecotoxicological information available for the assessed chemical, it is not expected to be harmful to aquatic life. Therefore, the assessed chemical does not satisfy the criteria for classification under the GHS for acute and chronic aquatic toxicities (UNECE 2017).

Summary of environmental risk

The assessed chemical will not be manufactured in Australia. It will be imported into Australia as a component of finished flame retardant sealant products at up to 20% concentration for use in the construction industry.

No environmental exposures of the assessed chemical are expected during use or end of life disposals.

A Risk Quotient (PEC/PNEC) for the aquatic compartment was not calculated as the currently available information indicates the assessed chemical is not harmful to aquatic life and release of the assessed chemical to the aquatic environment will be negligible based on the assessed use pattern. Therefore, based on the low hazard and low exposure, the environmental risk from the introduction of the assessed chemical can be managed.

Means for managing risk

Workers

Information relating to safe introduction and use

The information in this statement, should be used by a person conducting a business or undertaking at a workplace (such as an employer) to determine the appropriate controls under the relevant jurisdiction Work Health and Safety laws.

The following control measures could be implemented to manage the risk arising from exposure to the assessed chemical during end use:

- Use of safe work practices to
  - Avoid contact with skin and eyes
  - Avoid inhalation of dusts

- Use of personal protective equipment (PPE)
  - Impervious gloves
  - Protective clothing
  - Respiratory protection if inhalation exposure may occur.

- A copy of the Safety Data Sheet (SDS) should be easily accessible to workers.

Conclusions

The Executive Director is satisfied that the risks to human health or the environment associated with the introduction and use of the industrial chemical can be managed.

Note:

1. Obligations to report additional information about hazards under s 100 of the *Industrial Chemicals Act 2019* apply.
2. You should be aware of your obligations under environmental, workplace health and safety and poisons legislation as adopted by the relevant state or territory.

Supporting information

Chemical identity

CAS number	12777-87-6
CAS name	Sulfuric acid, compd. with graphite (1:?)
Molecular formula*	$C.xH_2O_4S$
SMILES (canonical)*	[C].O=S(=O)(O)O

Additional chemical identity information

* This chemical has been represented according to CAS nomenclature/identity conventions. Typical purity is 100%.

Relevant physical and chemical properties

Physical form	Silver grey powder	
Melting point	Decomposes before melting when heated	
Density	0.4 – 0.7	kg/m^3
Water solubility	Insoluble	
Particle size	Inhalable fraction (< 100 µm): < 1 Respirable fraction (< 10 µm): 0	% %
Ionisable in the environment	No	

Human exposure

Workers

Only trained personnel will be involved in handling products containing the assessed chemical. Potential dermal, ocular and inhalation exposure of workers to the assessed chemical may occur during end use applications. The applicant has stated that workers will wear appropriate personal protective equipment due to the presence of other hazardous materials in the workplace. While no dust is expected during end use operations, dust containing the assessed chemical may be generated during dismantling or mechanical processing of cured products.

Health hazard information

Acute toxicity

Oral

In an acute oral toxicity study (OECD TG 423), 6 female Wistar rats were administered a single dose of 2,000 mg/kg bw of the assessed chemical suspended in vehicle (cottonseed oil) via oral gavage. All animals survived until the end of the study period (14 days) without showing any clinical signs of toxicity. The body weight gain of the animals was within the normal range and no macroscopic findings were recorded at necropsy. The acute oral median lethal dose (LD50) value was determined to be > 2,000 mg/kg bw. Based on the results of this study, the assessed chemical is of low acute oral toxicity.

Dermal

In an acute dermal toxicity study (OECD TG 402), the assessed chemical was applied at a single dose of 2,000 mg/kg bw evenly to the intact skin of 10 Wistar rats (n = 5/sex) and covered with a semi-occlusive dressing for 24 hours. No mortalities or signs of systemic toxicity were observed. In one male, erythema (grade 2) was observed on day 2 and a small wound close to the application site was observed from days 2 to 12. These were reversible within the observation period and although considered to be not treatment related by the study authors, no explanation for the findings was given. The acute dermal LD50 for the study was determined to be > 2,000 mg/kg bw. Based on the results of this study, the assessed chemical is of low acute dermal toxicity.

Corrosion/Irritation

Skin irritation

An acute dermal toxicity study (see **Acute toxicity – Dermal**) was provided to assess the skin irritation potential of the assessed chemical. Based on the results of this study, the assessed chemical is at most slightly irritating to the skin.

Eye irritation

In an eye irritation study (OECD TG 405), 0.1 g of the assessed chemical was instilled into one eye of each of 3 female New Zealand White rabbits. The animals were observed for 72 hours after treatment, and then 7 days later. The mean of the individual scores at 24, 48 and 72 hours for the 3 animals were 1.0, 1.0 and 1.34 for conjunctival redness,1.0, 0.67 and 1.34 for chemosis and 0.34, 0.0 and 0.0 for corneal opacity. All observed effects were fully reversible within 10 days. Therefore, under the conditions of the study, the assessed chemical is considered slightly irritating to the eyes.

Observation in humans

The applicant submitted information about the incidence of dermal and ocular irritation in workers at 6 facilities manufacturing the assessed chemical. Among approximately 90 workers that handled the assessed chemical over periods of up to 18 years, one case of dermal irritation and one case of eye irritation were reported. It was uncertain whether the reported cases resulted from exposure to the assessed chemical or to other material.

Sensitisation

Skin sensitisation

No skin sensitisation data was submitted for the assessed chemical. This application meets the following condition for an information waiver for skin sensitisation:

- exposure considerations – workplace use only; not used for consumer applications.

Observation in humans

The applicant submitted information about the incidence of sensitisation in workers at 6 facilities manufacturing the assessed chemical. Among approximately 90 workers that handled the assessed chemical over periods of up to 18 years, no cases of skin sensitisation were reported. One case of an allergic respiratory reaction was observed. Based on these observations, the assessed chemical is not considered to be a skin sensitiser.

Repeat dose toxicity

Oral

In a repeated dose oral toxicity study (OECD TG 408), the assessed chemical suspended in sterile water was administered to groups of Wistar rats (n = 10/sex/dose) by oral gavage at doses of 0 (vehicle control), 62.5, 250 and 1,000 mg/kg bw/day for 90 days. There were no mortalities or clinical effects related to exposure to the assessed chemical observed throughout the course of the study. Food and water consumption was normal and there were no differences in body weight or body weight gain observed between treated animals and the respective control animals.

Differences were observed in organ weights, such as heart, adrenal glands and thymus. The mean absolute and relative heart weights were reduced in low dose (-11% and -12%, respectively) and mid dose males (-12% and -10%, respectively) and mid dose females (-9% and -9%, respectively) compared with their respective controls. In addition, reduced mean absolute and relative left adrenal weights (-13% and -16%, respectively) and mean absolute and relative right adrenal weights (-9% and -17%, respectively) were reported in mid dose females. The mean absolute and relative thymus weights were reduced in the females at the low dose (-14% and -16%, respectively). The mean absolute and relative weights of the left epididymis were increased in mid dose males (+10% and +13%, respectively). The mean absolute and relative weights of the right ovary were reduced in high dose females (-14% and -18%, respectively). As no dose response relationship was evident in relation to these changes, the study authors considered these to be incidental and not treatment related.

There were minor haematological and biochemical discrepancies recorded; however, these did not follow a consistent exposure-related pattern and were considered as not adverse by the study authors. For example, there were higher relative, but not absolute, levels of neutrophil granulocytes compared to the respective controls in the high dose males. Similarly, the low dose males had lower relative, but not absolute, levels of lymphocytes compared to the respective controls. Haemoglobin levels were slightly lower than the respective controls in the mid dose males and low dose females, while the mid dose males also had lower haematocrit levels. Lower concentrations of calcium and chloride electrolytes were found in the male high dose and low dose groups compared to the control group. In contrast, the female low dose group showed higher calcium and chloride concentrations compared to the control group.

The only adverse findings reported at necropsy were a benign bone tumour (an exostosis) in the femur of one mid dose male and an adhesion of a liver lobe to the pylorus, associated with haemorrhage, inflammation and necrosis, in one mid dose female. Some inconsistent organ discolouration was also reported. As all macroscopic and histopathological findings were consistent with the spectrum of background pathology in the strain of rats used, these were considered by the study authors to not be treatment related. There was also no evidence of functional impairment or histopathology that suggested the observed organ weight changes were adverse. As none of the observed effects were attributable to the assessed chemical, the NOAEL was established at 1,000 mg/kg bw/day in this study.

Genotoxicity

A study was performed to evaluate the potential of the assessed chemical to cause point mutations in a bacterial reverse mutation assay using *Salmonella typhimurium* strains TA98, TA100, TA102, TA1535 and TA1537 in both the presence and absence of metabolic activation (S9-mix) (OECD TG 471). Due to the insolubility of the assessed chemical, polar and non-polar extracts of the chemical (in 0.9% NaCl and DMSO, respectively) were used as the test substance. The concentration of the 100% extracts corresponded to a weight/volume ratio of 0.2 g/mL. No significant increases in the frequency of revertant colonies were recorded for any of the bacterial strains up to 100% concentration of test substance, either with or without metabolic activation. However, it was noted that, contrary to test guideline recommendations, 2-aminoanthracene was used as the only positive control for the efficacy of the S9-mix. Under the conditions of this study, the assessed chemical was not mutagenic.

The assessed chemical was also tested for its clastogenic and aneugenic potential in an in vitro mammalian micronucleus test using human lymphocytes (OECD TG 487). To provide a suitable test sample, the chemical was extracted in cell culture medium at a weight/volume ratio of 0.2 g/mL for 72 h at 37°C. The extract was centrifuged and filtered before being applied to cells at concentrations up to 100%. Three exposure conditions were used for the study: a 4-hour exposure in the presence and absence of metabolic activation (S9-mix) (Experiment 1) and a 44-hour exposure in the absence of metabolic activation (Experiment 2).

In Experiment 1, the assessed chemical demonstrated no evidence of cytotoxicity, except in the 80% concentration group with metabolic activation and the 70% concentration group without metabolic activation. No increase in the frequency of cells with micronuclei was recorded at any dose tested up to 100%, either with or without metabolic activation. In Experiment 2, no cytotoxicity was seen below 70% concentration, however, precipitation of the assessed chemical was seen at concentrations above 40%. Therefore, this was the highest concentration assessed for micronucleus formation in this experiment. A dose-effect relationship was found in this experiment, up to a 50% increase in micronucleus frequency over the control at the highest tested dose, but the frequencies observed were within the range of the historical data of the negative control and the increases were not statistically significant. The results indicate that the assessed chemical is unlikely to be clastogenic or aneugenic to human lymphocytes in vitro.

Environmental exposure

Exposures to the environment during manufacturing, reformulation or re-packaging processes are not expected. The products containing the assessed chemical will be imported into Australia as the finished sealant products containing the assessed chemical at up to 20% concentration for use in the construction industry. No environmental release is expected during transport and storage. Any release from accidental spills is expected to be limited and to be

collected and disposed of in accordance with the relevant State, Territory and Federal regulations.

Sealant products containing the assessed chemical will be used on construction sites by professional workers. Product will be used by placing it at suitable locations where gaps such as those surrounding pipes would want to be filled/blocked during a fire. The product expands to block and to slow down the spread during fire. The product containing the assessed chemical is suitably placed during the appropriate stage of the building process and will not be in direct contact with the environment. At the end of their service life, the products containing the assessed chemical will be disposed of by an accredited waste management facility in accordance with relevant Local, State, Territory and Federal regulations.

Environmental fate

Partitioning

No environmental fate data were submitted. The assessed chemical is expected to share the fate of the product or substrate into which it has been incorporated. As it is cured into a solid matrix, the assessed chemical is not expected to be either bioavailable or mobile.

Degradation

No information on the degradation of the assessed chemical was provided. The assessed chemical is inorganic and therefore, excluded from persistence classification.

Bioaccumulation

Bioaccumulation is not expected due to the inorganic nature of the assessed chemical and the absence of lipophilic functional groups.

Predicted environmental concentration (PEC)

The predicted environmental concentration (PEC) has not been calculated as release of the assessed chemical to the aquatic environment is not expected based on its assessed use patterns.

Environmental effects

Effects on aquatic Life

In the supplied ecotoxicity studies detailed below, a suspension containing the assessed chemical was filtered through a 0.45 µm or 0.42 µm screen and the filtrate was used as the test solution. The assessed chemical has a particle size DT10 of 276.1 µm; any particles present in the suspension were likely removed during filtration. The concentration of the assessed chemical in the filtrate was not quantified. However, it is unlikely that the test subjects were exposed to the assessed chemical as it is considered insoluble (see **Relevant physical and chemical properties**). Furthermore, both graphite and sulfuric acid were assessed as having low environmental concern under the IMAP framework (NICNAS 2016a; 2016b).

Acute toxicity

The following median lethal concentration (LC50) and effect concentration (EC50) values for model organisms were provided by the applicant:

Taxon	Endpoint	Method
Fish	96 h LC50 > 100 mg/L	*Oncorhynchus mykiss* (Rainbow trout) OECD TG 203 Static conditions Nominal concentration
Invertebrate	48 h LC50 > 100 mg/L	*Daphnia magna* (Water flea) Immobility/other effect OECD TG 202 Static conditions Nominal concentration
Algae	72 h ErC50 > 100 mg/L	*Pseudokirchneriella subcapitata* (Green algae) Growth rate OECD TG 201 Static conditions Nominal concentration

Chronic toxicity

The following no-observed-effect concentration (NOEC) value of the assessed chemical for the model organism was provided by the applicant:

Taxon	Endpoint	Method
Algae	72 h NOEC ≥ 100 mg/L	*Pseudokirchneriella subcapitata* (Green algae) Growth rate OECD TG 201 Static conditions Nominal concentration

Predicted no-effect concentration (PNEC)

A predicted no-effect concentration (PNEC) for the aquatic compartment was not calculated as the assessed chemical is not harmful to aquatic life up to its water solubility limit.

Categorisation of environmental hazard

As the assessed chemical is inorganic, it is excluded from categorisation under the *Australian Environmental Criteria for Persistent, Bioaccumulative and/or Toxic Chemicals* (DCCEEW 2022).

Environmental risk characterisation

A Risk Quotient (PEC/PNEC) for the aquatic compartment was not calculated as the currently available information indicates the assessed chemical is not harmful to aquatic life and release of the assessed chemical to the aquatic environment will be negligible based on the assessed use pattern. Based on the low hazard and the assessed use pattern, the risk from the introduction of the assessed chemical can be managed.

References

DCCEEW (2022) Australian Environmental Criteria for Persistent, Bioaccumulative and/or Toxic Chemicals, DCCEEW, accessed March 2025.

NICNAS (National Industrial Chemicals Notification and Assessment Scheme) (2016a) *IMAP Single Assessment Report – Graphite: Environment tier I assessment*, NICNAS, accessed March 2025.

NICNAS (National Industrial Chemicals Notification and Assessment Scheme) (2016b) *IMAP Single Assessment Report – Sulfuric acid: Environment tier I assessment*, NICNAS, accessed March 2025.

UNECE (United Nations Economic Commission for Europe) (2017). Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Seventh Revised Edition. Accessed 2 April 2025.