2-Propen-1-ol, 3-phenyl-: Human health tier II assessment

25 November 2016

CAS Number: 104-54-1

Preface

This assessment was carried out by staff of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) using the Inventory Multi-tiered Assessment and Prioritisation (IMAP) framework.

The IMAP framework addresses the human health and environmental impacts of previously unassessed industrial chemicals listed on the Australian Inventory of Chemical Substances (the Inventory).

The framework was developed with significant input from stakeholders and provides a more rapid, flexible and transparent approach for the assessment of chemicals listed on the Inventory.

Stage One of the implementation of this framework, which lasted four years from 1 July 2012, examined 3000 chemicals meeting characteristics identified by stakeholders as needing priority assessment. This included chemicals for which NICNAS already held exposure information, chemicals identified as a concern or for which regulatory action had been taken overseas, and chemicals detected in international studies analysing chemicals present in babies' umbilical cord blood.

Stage Two of IMAP began in July 2016. We are continuing to assess chemicals on the Inventory, including chemicals identified as a concern for which action has been taken overseas and chemicals that can be rapidly identified and assessed by using Stage One information. We are also continuing to publish information for chemicals on the Inventory that pose a low risk to human health or the environment or both. This work provides efficiencies and enables us to identify higher risk chemicals requiring assessment.

The IMAP framework is a science and risk-based model designed to align the assessment effort with the human health and environmental impacts of chemicals. It has three tiers of assessment, with the assessment effort increasing with each tier. The Tier I assessment is a high throughput approach using tabulated electronic data. The Tier II assessment is an evaluation of risk on a substance-by-substance or chemical category-by-category basis. Tier III assessments are conducted to address specific concerns that could not be resolved during the Tier II assessment.

These assessments are carried out by staff employed by the Australian Government Department of Health and the Australian Government Department of the Environment and Energy. The human health and environment risk assessments are conducted and published separately, using information available at the time, and may be undertaken at different tiers.

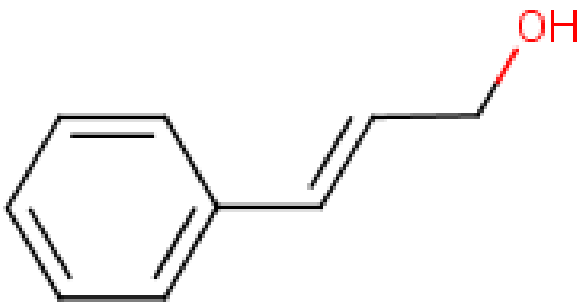
This chemical or group of chemicals are being assessed at Tier II because the Tier I assessment indicated that it needed further investigation.

For more detail on this program please visit:www.nicnas.gov.au

Disclaimer

Acronyms & Abbreviations

Chemical Identity

Synonyms	3-phenyl-2-propen-1-ol cinnamic alcohol cinnamyl alcohol
Structural Formula	
Molecular Formula	C9H10O
Molecular Weight (g/mol)	134.18
Appearance and Odour (where available)	White to yellowish solid that becomes a liquid at 27°C. Pleasant, floral fragrance.
SMILES	c1(C={t}CCO)ccccc1

Import, Manufacture and Use

Australian

The chemical has reported commercial use in industrial cleaners.

Various online databases indicate that the chemical is an ingredient in a number of consumer products available in Australia.

The chemical has reported cosmetic use as a fragrance ingredient in perfumes and personal care products.

The chemical has reported domestic use as a fragrance ingredient in:

- air care products (air fresheners, deodorisers, scented candles); and
- household cleaning products.

International

The following international uses have been identified through the European Union (EU) Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) dossiers; Galleria Chemica; the Substances and Preparations in Nordic countries (SPIN) database; the European Commission Cosmetic Ingredients and Substances (CosIng) database; the United States (US) Personal Care Products Council International Nomenclature of Cosmetic Ingredients (INCI) Dictionary; the US Environmental Protection Agency Aggregated Computer Toxicology Resource (ACToR); the US Environmental Protection Agency Chemical and Product Categories (CPCat) database; and the US National Library of Medicine, Hazardous Substances Data Bank (HSDB).

The chemical has reported cosmetic uses as an ingredient in:

- perfumes and fragrances; and
- personal care products.

The chemical has reported domestic uses, including in:

- washing and cleaning products;
- stain removers;
- lime deposit removers;
- air care products (air fresheners, deodorisers, candles); and
- polishes and wax blends.

The chemical has reported commercial uses, including:

- in the manufacture of cleaning products;
- in surface treatment products;
- as a component of absorbents and adsorbents; and
- in lubricants and additives.

The chemical has reported site-limited use as a chemical intermediate.

The chemical has reported non-industrial uses as:

- an additive in pharmaceutical products;
- a biocidal product (pesticide);
- a food additive (flavouring agent); and
- an agricultural product (feed additive).

Restrictions

Australian

No known restrictions have been identified.

International

The chemical is listed on the following (Galleria Chemica):

- European Directive 2009/48/EC of the European Parliament and of the Council on the safety of toys—Allergenic fragrances toys shall not contain;
- EU Regulation (EC) No. 1223/2009 of the European Parliament and of the Council of 30 November 2009 on cosmetic products: Annex III—List of substances which cosmetic products must not contain except subject to the restrictions laid down. The presence of the substance must be indicated in the list of ingredients when its concentration exceeds 0.001 % in leave-on products and 0.01 % in rinse-off products;
- New Zealand Cosmetic Products Group Standard—Schedule 5: Components cosmetic products must not contain except subject to the restrictions and conditions laid down. The presence of the substance must be indicated in the list of ingredients when its concentration exceeds 0.001 % in leave-on products and 0.01 % in rinse-off products.

The chemical is also included in the International Fragrance Association (IFRA) Standards: the Research Institute for Fragrance Materials (RIFM) Expert Panel established the No Expected Sensitisation Induction Level (NESIL) of 3000 µg/cm^2 for cinnamic alcohol (IFRA, 2016).

Existing Work Health and Safety Controls

Hazard Classification

The chemical is not listed on the Hazardous Substances Information System (HSIS) (Safe Work Australia).

Exposure Standards

Australian

No specific exposure standards are available.

International

The following exposure standard is identified (Galleria Chemica):

An exposure limit of 5 mg/m^3 time weighted average (TWA) in Russia.

Health Hazard Information

Cinnamyl alcohol (CAS No. 104-54-1) belongs to a family of structurally-related compounds that also includes cinnamaldehyde (CAS No. 104-55-2). Cinnamyl compounds have widespread uses as fragrance and flavour ingredients. The chemical compounds also share common routes of absorption, distribution and metabolic detoxification, and exhibit similar toxicological properties. Following absorption by oral, dermal and inhalation routes, cinnamyl alcohol is oxidised to various cinnamic metabolites such as the more reactive cinnamaldehyde, which is considered a major driver for toxicity, particularly for local effects such as skin sensitisation. Cinnamaldehyde has previously been assessed by NICNAS (NICNAS). Where appropriate, data for cinnamaldehyde may be read-across where data are lacking for cinnamyl alcohol.

Toxicokinetics

Absorption

The chemical is rapidly absorbed from the gastrointestinal tract based on excretion data in rats, with 83 % of an oral dose of cinnamyl alcohol absorbed through the stomach and excreted in the urine within 24 hours. Over 90 % of the chemical was recovered in the urine and faeces within 72 hours (IPCS, 2001; REACH). Cinnamyl alcohol is also partially absorbed through the skin, with a greater degree of absorption occurring under occlusive conditions (25 % under non-occlusive conditions, compared with 75 % under occlusive conditions) (Letizia et al., 2005; REACH).

Distribution

Limited distribution data are available; however, the chemical is expected to have a similar distribution pattern to the metabolite, cinnamaldehyde, which is primarily found in the gastrointestinal tract, kidneys and liver (NICNAS).

Metabolism

Metabolism of the chemical occurs at all sites of absorption, typically starting with oxidation by alcohol dehydrogenase to generate firstly cinnamaldehyde, then cinnamic acid as the predominant metabolic intermediate. Following further oxidation and glutathione conjugation, hippuric acid is the major urinary metabolite. A number of minor metabolites have also been identified (Bickers et al., 2005; Letizia et al., 2005). Reactive epoxide intermediates such as epoxy cinnamyl alcohol and epoxy cinnamaldehyde have been identified in bioactivation studies using human liver microsomes (Niklasson et al., 2014); however, these chemical species are highly unstable and have not yet been detected in animal or human studies.

Excretion

As the chemical is excreted rapidly in the urine (83 %), and to a minor extent in the faeces (6 %), bioaccumulation of the chemical is expected to be low (Adams et al., 2004; REACH).

Acute Toxicity

Oral

The chemical has low acute toxicity based on results from animal tests following oral exposure. The median lethal dose (LD50) in rats ranges from 2000–2200 mg/kg body weight (bw). No sub-lethal effects were reported (Adams et al., 2004; Bickers et al., 2005; Letizia et al., 2005; REACH).

Dermal

The chemical has low acute toxicity based on results from animal tests following dermal exposure. The LD50 in rats is >5000 mg/kg bw. The only clinical sign observed was anorexia (Letizia et al., 2005; REACH).

Inhalation

No data are available.

Corrosion / Irritation

Respiratory Irritation

No data are available for the chemical.

The metabolite, cinnamaldehyde, may be generated following auto-oxidation of the chemical on the surface of the mucous membranes or through oxidation of the personal care product containing the chemical prior to use. While cinnamaldehyde is a known respiratory irritant (NICNAS), no serious irritant effects are expected at the low concentrations reported in products containing the chemical.

Skin Irritation

The available information from animal studies suggests that the chemical is a weak to moderate skin irritant. However, no signs of irritation have been observed in a number of human studies (see **Observation in humans** section). Considering the lack of effects in humans at concentrations similar to those reported in cosmetic and domestic products, hazard classification is not warranted for such purposes.

The chemical, applied undiluted to intact or abraded rabbit skin (strain not reported) for 24 hours under occlusive conditions, was found to be moderately irritating. No information was given on the type, scoring or reversibility of the observed effects (REACH). The chemical was non-irritating or mildly irritating to guinea pig skin in a number of irritation screening tests using a variety of vehicles at concentrations ranging from 0.1–100 % (Bickers et al., 2005).

Aerial oxidation of the chemical cinnamyl alcohol prior to use or on the surface of the skin can generate cinnamaldehyde. Cinnamaldehyde is moderately irritating to rabbit skin, and produces irritating effects in humans at low concentrations (NICNAS). The oxidation of cinnamyl alcohol to cinnamaldehyde will be dependent on the duration of dermal exposure to personal care products containing the chemical.

Eye Irritation

No data are available for the chemical. However, the metabolite, cinnamaldehyde, may be generated following auto-oxidation of the chemical on the surface of the mucous membranes or through oxidation of the personal care product containing the chemical prior to use. While cinnamaldehyde is a known eye irritant (NICNAS), no serious irritant effects are expected at the low concentrations reported in products containing the chemical.

Observation in humans

The chemical did not cause skin irritation in humans in a number of reports, indicating that there was low concern for irritation.

In a patch test with 20 human subjects, the undiluted chemical was applied to the skin of the inner arm under occlusive conditions for 24 hours. During a five day observation period, no signs of irritation were observed (MAK, 2013; REACH).

Cinnamyl alcohol produced no signs of irritation in 600 male and female volunteers when tested at concentrations of 4–10 % in various vehicles (Bickers et al., 2005).

Sensitisation

Skin Sensitisation

The chemical is considered to be a weak skin sensitiser based on the positive results seen in several local lymph node assays (LLNAs), with the EC3 value (concentration required to produce a three-fold increase in lymphocyte proliferation compared with controls) reported to be in the range of 17.9–21 %. The effects observed in human patch test studies also indicate that the chemical has the potential to cause skin sensitisation (see **Observation in humans** section), warranting hazard classification (see **Recommendation** section). The chemical is also a recommended positive reference standard for the Organisation for Economic Co-operation and Development (OECD) Test Guideline (TG) 429 (skin sensitisation) (ICCVAM, 2009). Given that the chemical also metabolises to cinnamaldehyde, a known sensitiser (NICNAS), hazard classification is warranted.

In a study equivalent to OECD TG 429, cinnamyl alcohol was reported to be weakly positive for skin sensitisation in an in vivo mouse LLNA. The mice were administered the chemical at 0, 2.5, 10, 20 or 50 % (w/v) in acetone/olive oil (4:1 ratio). Stimulation indices of 1, 1.98, 2.25, 3.31 and 4.12 were reported, and the EC3 value was determined to be 17.9 % (Ulker et al., 2014).

In a similar study, the chemical tested at 0, 10, 25, 50 and 90 % in acetone/olive oil (4:1 ratio), produced weakly positive results for skin sensitisation with stimulation indices of 1, 1.8, 3.5, 3.9 and 5.7, respectively. An EC3 value of 21 % was calculated (Gerberick et al., 2005).

The chemical is reported to be a weak to moderate sensitiser at almost all concentrations (0.1–40 %) studied in several different guinea pig sensitisation tests (Bickers et al., 2005; Danish EPA, 2016; REACH). Little to no evidence of sensitisation was observed in animals treated with the chemical at concentrations ranging from 0.1–5 %, in a variety of vehicles in four different guinea pig maximisation tests (GPMTs), Buehler and modified Draize tests (Bickers et al., 2005). Clear evidence of sensitisation was observed in animals treated with cinnamyl alcohol at 10–40 %, in several GPMTs, Buehler tests and modified Draize tests.

Although cinnamyl alcohol is a weak sensitiser in animal studies, it can undergo activation either on the surface of the skin, via aerial oxidation (auto-oxidation), or by enzyme bioactivation in the dermal layer to produce cinnamaldehyde—a significantly more potent skin sensitiser (NICNAS). The EC3 values for cinnamyl alcohol decreased from 20.1 to 4.9 % following aerial oxidation of a sample of the chemical for two weeks (Karlberg et al., 2013). The observed increase in sensitisation potential is thought to be due to the formation of cinnamaldehyde and epoxy cinnamyl alcohol via aerial oxidation (Niklasson et al., 2013). In several GMPTs, guinea pigs had positive reactions to cinnamyl alcohol following an induction phase using cinnamaldehyde and challenge with cinnamyl alcohol, and vice versa (Bickers et al., 2005). These cross-reactions between cinnamaldehyde and cinnamyl alcohol suggest that cinnamaldehyde may be the active substance responsible for the allergic reactions. However, cases of cinnamyl alcohol sensitisation in the absence of cross-reactions to cinnamaldehyde (both GMPTs and human studies) indicate that the mechanism may be more complex. This may be due to the formation of epoxy cinnamyl alcohol, which is not generated upon cinnamaldehyde administration, and is a stronger skin sensitiser than cinnamaldehyde in the LLNA (EC3 value of 0.58 %, compared with 0.75 % for cinnamaldehyde) (Niklasson et al., 2013; Niklasson et al., 2014).

Observation in humans

The chemical is a well-recognised and frequently reported contact allergen (SCCNFP, 1999; RIVM, 2009; MAK, 2013). It is a component of 'the fragrance mix', used by dermatologists to diagnose allergies to common fragrances and cosmetic compounds. It accounts for 5–14 % of patient reactions to the fragrance mix, and has been shown to be a cause of allergic reactions by patch test in up to 75 % of patients with eczema from cosmetic products (SCCNFP, 1999). A recent review by the Danish Environmental Protection Agency (EPA) recommended that the chemical be classified as a Class 1A skin sensitiser, based on the high frequency of positive results observed in human patch test studies, as well as the relatively high number of published cases in relation to the estimated low exposure from cosmetic and domestic products (Danish EPA, 2016).

A number of human maximisation tests (carried out using vehicles such as petrolatum and diethyl phthalate) found that the chemical induced skin sensitisation in 79/527 of volunteers, at a concentration of 10 %. No reactions were observed at a concentration of 4 % in 49 volunteers. In additional studies carried out under exaggerated conditions (nine, 48-hour occluded induction applications followed two weeks later by two, consecutive 48-hour occluded challenge applications), a concentration of 4 % cinnamyl alcohol in ethanol induced sensitisation effects in 5/180 subjects. In addition, human repeated insult patch test (HRIPT) data indicate that the chemical was sensitising at 4 % under occluded conditions but not upon repeated open applications (Bickers et al., 2005).

Repeated Dose Toxicity

Oral

Considering the no observed adverse effect levels (NOAELs) available from a single 4-month rat study (53.5 mg/kg bw—the highest dose tested), as well as the NOAEL values for the metabolite cinnamaldehyde (68–200 mg/kg bw/day), repeated oral exposure to the chemical is not likely to cause serious damage to health.

Cinnamyl alcohol is considered to be safe for human consumption as a flavouring agent by the US Food and Drug Administration (FDA), provided it is used in the minimum quantity required to produce the intended effect (US FDA, 2015). This reflects the low level of concern regarding the potential of cinnamyl alcohol for long-term toxicity via the oral route.

In a non-guideline study, cinnamyl alcohol in sunflower oil (equivalent to 2 % of the LD50 for the chemical) was administered to white rats (12 male animals/group, strain not specified) daily, at 53.5 mg/kg bw/day, over a 4-month period. No positive or negative controls were reported. No significant changes to liver function were observed in the treated animals (Adams et al., 2004).

Dermal

No data are available for the chemical. Based on the information available for the metabolite cinnamaldehyde (NICNAS), the chemical is not expected to cause serious damage to health upon repeated dermal exposure.

Inhalation

No data are available for the chemical or the metabolite, cinnamaldehyde (NICNAS).

Genotoxicity

Based on the limited data available from in vitro studies and the lack of genotoxic activity observed for the more reactive metabolite, cinnamaldehyde (NICNAS), the chemical cinnamyl alcohol is not expected to be genotoxic.

The chemical was negative in Ames tests carried out in *Salmonella typhimurium* strains TA 1535, TA 1537, TA 1538, TA 98 and TA 100, as well in *Escherichia coli* WP2 uvr A (trp-), with and without metabolic activation. The chemical was tested at concentrations of 0, 250, 750, 1500 or 3000 µg/plate. The chemical was negative for mutagenicity in all strains tested, with and without metabolic activation (Bickers et al., 2005; Letizia et al., 2005; REACH).

Cinnamyl alcohol tested positive in two out of three DNA repair tests (rec assays) in *Bacillus subtilis* M45 (rec-) and H17 (rec+). However, the positive results were observed at doses approaching cytotoxic levels (Adams et al., 2004).

In a non-guideline study investigating DNA damage and repair, the chemical (33.3 µmol/L, equivalent to 4.5 mg/L) produced negative results in a sister chromatid exchange assay with Chinese hamster ovary cells without metabolic activation. Mitomycin C was used as a positive control (REACH).

The chemical cinnamyl alcohol has been reported to produce a dose-related increase in the incidence of reversions in L5178Y mouse lymphoma cells, with and without metabolic activation; however, the study report did not provide sufficient details regarding the concentrations tested or cytotoxic effects to allow adequate evaluation of the results (Adams et al., 2004).

Carcinogenicity

Based on the results from limited animal studies, the chemical is not likely to be carcinogenic. The more reactive metabolite, cinnamaldehyde, was found to be non-carcinogenic in a two-year oral feed study (NICNAS).

Cinnamyl alcohol was examined for its ability to induce lung tumours in male and female A/He mice (15 animals/sex/dose). The chemical in tricaprylin was administered three times weekly via intraperitoneal (i.p.) injections at doses of 58 mg/kg bw/dose and 292 mg/kg bw/dose for eight weeks. No evidence of carcinogenicity was observed under the conditions tested (Bickers et al., 2005).

Reproductive and Developmental Toxicity

The chemical is not expected to cause reproductive toxicity based on the available animal studies and information for the more reactive metabolite, cinnamaldehyde (NICNAS).

Groups of 14–15 female rats were orally administered cinnamyl alcohol at 0, 5.35 or 53.5 mg/kg bw/day for the entire duration of pregnancy. No significant effects on offspring bodyweight, size, survival number or general development were observed in test animals, either at birth or after one month. The NOAEL was determined as 53.5 mg/kg bw/day (Bickers et al., 2005; REACH).

Risk Characterisation

Critical Health Effects

The critical health effect for risk characterisation is skin sensitisation.

Public Risk Characterisation

Considering the range of cosmetic and domestic products that contain the chemical in Australia, the main routes of public exposure are expected to be dermal, inhalational (air care and personal care aerosols) and oral (lip and oral hygiene products).

The oxidation product of cinnamyl alcohol, cinnamaldehyde, is potentially hazardous (skin sensitisation), and will be present at low concentrations in consumer products containing cinnamyl alcohol. This is particularly true of products containing cinnamyl alcohol at high concentrations, with long shelf-lives.

The chemical is readily available, and is expected to be widely distributed for use as a raw fragrance material. However, the distribution of the chemical for fragrance purposes is expected to be controlled by members of IFRA. The restriction of the chemical under the IFRA Standard is expected to sufficiently manage the public risks associated with chemical exposure through fragrances (e.g. concentration limit in finished products of 0.09 % – 2.2 % of the chemical (IFRA, 2016)).

Occupational Risk Characterisation

During product formulation, dermal, ocular and inhalation exposure may occur, particularly where manual or open processes are used. These could include transfer and blending activities, quality control analysis, and cleaning and maintaining equipment. Worker exposure to the chemical at lower concentrations could also occur while using formulated products containing the chemical. The level and route of exposure will vary depending on the method of application and work practices employed. Oral exposure is also possible but can be prevented by good hygiene practices.

Given the critical local health effects (skin sensitisation), the chemical could pose an unreasonable risk to workers unless adequate control measures to minimise dermal exposure are implemented. The chemical should be appropriately classified and labelled to ensure that a person conducting a business or undertaking (PCBU) at a workplace (such as an employer) has adequate information to determine the appropriate controls.

The data available support an amendment to the hazard classification in the Hazardous Substances Information System (HSIS) (Safe Work Australia) (refer to **Recommendation** section).

NICNAS Recommendation

The chemical is recommended for Tier III assessment to undertake a quantitative risk assessment to characterise the risk associated with auto-oxidation of the chemical to the more active compound, cinnamaldehyde. Further risk management may be required if an unacceptable risk of exposure to oxidation products such as cinnamaldehyde exists from long-term storage of manufactured and/or imported products containing the chemical.

Sufficient information is available to recommend that risks for workplace health and safety be managed through changes to classification and labelling.

Assessment of the chemical is considered to be sufficient provided that risk management recommendations are implemented and all requirements are met under workplace health and safety and poisons legislation as adopted by the relevant state or territory.

Regulatory Control

Public Health

The need for regulatory controls for public health will be determined as part of the Tier III assessment.

Work Health and Safety

The chemical is recommended for classification and labelling under the current approved criteria and adopted GHS as below. This assessment does not consider classification of physical and environmental hazards.

Hazard	Approved Criteria (HSIS)[a]	GHS Classification (HCIS)[b]
Sensitisation	May cause sensitisation by skin contact (Xi; R43)	May cause an allergic skin reaction - Cat. 1 (H317)

[a] Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)].

[b] Globally Harmonized System of Classification and Labelling of Chemicals (GHS) United Nations, 2009. Third Edition.

[*] Existing Hazard Classification. No change recommended to this classification

Advice for consumers

Products containing the chemical should be used according to the instructions on the label.

Advice for industry

Control measures

Control measures to minimise the risk from dermal exposure to the chemical should be implemented in accordance with the hierarchy of controls. Approaches to minimise risk include substitution, isolation and engineering controls. Measures required to eliminate, or minimise risk arising from storing, handling and using a hazardous chemical depend on the physical form and the manner in which the chemical is used. Examples of control measures that could minimise the risk include, but are not limited to:

- health monitoring for any worker who is at risk of exposure to the chemical, if valid techniques are available to monitor the effect on the worker's health;
- air monitoring to ensure control measures in place are working effectively and continue to do so;
- minimising manual processes and work tasks through automating processes;
- work procedures that minimise splashes and spills;
- regularly cleaning equipment and work areas; and
- using protective equipment that is designed, constructed, and operated to ensure that the worker does not come into contact with the chemical.

Guidance on managing risks from hazardous chemicals are provided in the *Managing risks of hazardous chemicals in the workplace—Code of practice* available on the Safe Work Australia website.

Personal protective equipment should not solely be relied upon to control risk and should only be used when all other reasonably practicable control measures do not eliminate or sufficiently minimise risk. Guidance in selecting personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

Obligations under workplace health and safety legislation

Information in this report should be taken into account to help meet obligations under workplace health and safety legislation as adopted by the relevant state or territory. This includes, but is not limited to:

- ensuring that hazardous chemicals are correctly classified and labelled;
- ensuring that (material) safety data sheets ((M)SDS) containing accurate information about the hazards (relating to both health hazards and physicochemical (physical) hazards) of the chemical are prepared; and
- managing risks arising from storing, handling and using a hazardous chemical.

Your work health and safety regulator should be contacted for information on the work health and safety laws in your jurisdiction.

Information on how to prepare an (M)SDS and how to label containers of hazardous chemicals are provided in relevant codes of practice such as the *Preparation of safety data sheets for hazardous chemicals—Code of practice* and *Labelling of workplace hazardous chemicals—Code of practice*, respectively. These codes of practice are available from the Safe Work Australia website.

A review of the physical hazards of the chemical has not been undertaken as part of this assessment.

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