# 1,3-Isobenzofurandione: Human health tier II assessment

**28 June 2013**

## CAS Number: 85-44-9



## 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.

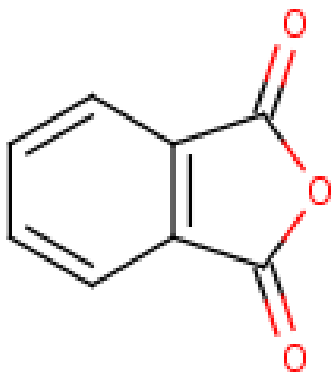
For more detail on this program please visit:www.nicnas.gov.au

**Disclaimer**

NICNAS has made every effort to assure the quality of information available in this report. However, before relying on it for a specific purpose, users should obtain advice relevant to their particular circumstances. This report has been prepared by NICNAS using a range of sources, including information from databases maintained by third parties, which include data supplied by industry. NICNAS has not verified and cannot guarantee the correctness of all information obtained from those databases. Reproduction or further distribution of this information may be subject to copyright protection. Use of this information without obtaining the permission from the owner(s) of the respective information might violate the rights of the owner. NICNAS does not take any responsibility whatsoever for any copyright or other infringements that may be caused by using this information.

Acronyms & Abbreviations

## Chemical Identity

| | |
|---|---|
| Synonyms | Phthalic anhydride<br>1,3-Phthalandione<br>1,3-Dioxophthalan<br>1,2-Benzenedicarboxylic anhydride<br>Isobenzofuran-1,3-dione |
| Structural Formula |  |
| Molecular Formula | C8H4O3 |
| Molecular Weight (g/mol) | 148.1166 |
| Appearance and Odour (where available) | White solid (flake or needle) or a clear colorless liquid (molten) with a mild, acrid odour. |
| SMILES | C1(=O)c2c(C(=O)O1)cccc2 |

# Import, Manufacture and Use

## Australian

The following Australian industrial uses were reported under previous mandatory and/or voluntary calls for information.

The chemical has reported commercial use including:

- manufacture of other chemicals.

The chemical has reported site-limited use including:

- manufacture of other chemicals.

## International

The following international uses have been identified via European Union Registration, Evaluation and Authorisation of Chemicals (EU REACH) dossiers, the Organisation for Economic Cooperation and Development Screening information data set International Assessment Report (OECD SIAR), Galleria Chemica, Substances and preparations in the Nordic countries (SPIN) database, and eChemPortal (OECD High Production Volume chemical program (OECD HPV)) , the US Environmental Protection Agency's Aggregated Computer Toxicology Resource (ACToR), and the US National Library of Medicine's Hazardous Substances Data Bank (HSDB)).

The chemical has reported domestic use in the SPIN database. However, it should be noted that SPIN does not distinguish between direct use of the chemical or use of the materials that are produced from chemical reactions (polymerisation) with the chemical. Uses reported include:

- used in coatings applications for home appliances, automobiles, medical devices and furniture;
- non-agricultural pesticides and preservatives; and
- paints, lacquers and varnishes.

The absence of the chemical from the available product ingredient databases indicates that it is not likely to be widely available for domestic use.

The chemical has reported commercial uses including:

- tanning and curing agents;
- solvents;
- cleaning/washing agents;
- adhesives, binding agents;
- corrosion inhibitors;
- construction materials;
- scorch inhibitor; and
- surface treatment.

The chemical has reported site-limited use including:

- an intermediate in chemical processes;

- plasticisers;
- unsaturated polyester resins;
- alkyd resins;
- intermediates for pigments and dyes; and
- flame retardants for polyesterpolyols.

The following non-industrial uses have been identified internationally:

- intermediates in the agricultural and pharmaceutical sector.

# Restrictions

## Australian

This chemical falls within the scope of anhydrides, organic acid, which are listed on Schedule 5 of the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) when used as curing agents and for epoxy resins. Schedule 5 chemicals are labelled with 'Caution'. These are substances with a low potential for causing harm, the extent of which can be reduced through by using appropriate packaging with simple warnings and safety directions on the label.

## International

*Food Packaging:*

Listed on the Europe Substances; listed in EU Directives on Plastics in Contact with Food.

# Existing Work Health and Safety Controls

## Hazard Classification

The chemical is classified as hazardous with the following risk phrases for human health in the Hazardous Substances Information System (HSIS) (Safe Work Australia):

Xn; R22 (acute toxicity)

Xi; R37/38, R41 (irritation/corrosion)

Xn; R42/43 (sensitisation)

## Exposure Standards

### Australian

The chemical has an exposure standard of 6.1 mg/m$^3$ (1 ppm) time weighted average (TWA).

### International

The following exposure standards are identified (Galleria Chemica):

- An exposure limit (TWA) of 6.1mg/m$^3$ (1 ppm) in different countries such as Canada (Alberta, Quebec), Indonesia, Malaysia, Singapore and Taiwan.
- An exposure limit (TWA) of 12 mg/m$^3$ (2 ppm) in different countries such as Philippines and USA (Air limits, Vermont).
- An exposure limit (TWA) of 1 mg/m$^3$ in different countries such as Denmark, Hungary, Latvia and Poland.

# Health Hazard Information

The chemical rapidly hydrolyses to phthalic acid (Cas No. 88-99-3) when in contact with water, including on moist surfaces such as the skin, lungs or in body fluids and tissues. Data for phthalic acid are considered representative of the systemic toxicity of the chemical and have been included in the report when no specific or valid data are available for the systemic toxicity of the chemical.

## Toxicokinetics

The chemical rapidly hydrolyses to phthalic acid (Cas No. 88-99-3) when in contact with water, including on moist surfaces such as the skin, lungs, or in body fluids and tissues (REACH).

It was reported in the OECD SIAR (2005), that humans exposed to the chemical through inhalation, demonstrated systemic absorption and excretion in the urine as unconjugated phthalic acid, with a half life of approximately 14 hours.

From a study using radiolabelled chemical reported in the IUCLID (2000), CD-1 mouse dams were injected intraperitoneally with $^{14}$C of 80 mg/kg bw/day of the chemical, during days 11, 12 and 13 of gestation. All tissues of the foetuses were found to contain the radiolabelled chemical indicating that the metabolite of the chemical may cross the placenta.

## Acute Toxicity

### Oral

The chemical is currently classified with the risk phrase ‘Harmful if swallowed (Xn; R22)’ in Australia (Safe Work Australia—HSIS). The data available support this classification.

In a reliable non-guideline study (REACH; OECD SIAR, 2005), an LD50 of 1530 mg/kg bw in male Wistar rats was reported for oral gavage. A single dose of 100, 500, 1000, 2000, 3100 or 5000 mg/kg bw in (2 ml/100g bw) dimethylsulfoxide (DMSO) was applied to 10 animals/dose. Clinical signs included sedation, imbalance and bloodshot eyes, although no gross pathology was reported.

### Dermal

The chemical was reported to have low acute toxicity via the dermal route (LD50 in rats is > 2000 mg/kg bw).

In a non-guideline study (REACH), five albino rabbits/sex/dose were exposed to 10000 mg/kg bw as a 50 % suspension in water for 4 hrs with wrapping. There were no mortalities and the local signs of mild erythema and oedema observed on removal of the wrapping, recovered on the same day. An LD50 > 10000 mg/kg bw was determined.

In another non-guideline study (IUCLID 2000, REACH) in rabbits, severe skin irritation was seen following a 24 hour exposure (refer to **Skin irritation** section). An LD50 > 3160 mg/kg bw was reported.

### Inhalation

In a non-guideline study (REACH), the median lethal dose concentration (LC50) was not reached at the highest technically feasible concentration (2.14 mg/L). Male and female Sprague Dawley rats (five animals/sex/dose) were exposed, by nose only, to aerosol inhalation for a single 4 hour period. One male died after the 4 hour exposure when removed from the chamber, but displayed no clinical signs prior to death. Clinical signs from surviving animals included hypoactivity, abnormal respiration, reduced faecal volume, ocular discharge and facial and/or anogenital staining, although all surviving animals recovered by day 14. The deceased animal revealed discoloration of the lungs and liver, however animals sacrificed after the 14 day observation period did not show any gross abnormalities.

### Observation in humans

A poorly documented human case (REACH) reported that a patient, who accidently inhaled a high concentration of phthalic anhydride for about 10 minutes, experienced burning sensations in the upper airways and coughing. For the following three months, wheezing, dyspnoea at rest and chest tightness, which was later diagnosed as bronchial asthma were experienced. One year later they were asymptomatic.

## Corrosion / Irritation

### Respiratory Irritation

The chemical is classified as hazardous with the risk phrase 'Irritating to respiratory system' (R37) in HSIS (Safe Work Australia). Cases of respiratory irritation in humans have been observed (refer to **Observations in humans** below).

### Skin Irritation

The chemical is classified as hazardous with the risk phrase 'irritating to skin' (R38) in HSIS (Safe Work Australia). The available OECD data indicate that the chemical is a slight irritant, however a non-guideline study and observations in humans support the classification.

In an OECD TG 404 (acute dermal irritation/corrosion) study (OECD, 2005), the shaved dorsal trunk of three male and three female rabbits was exposed for four hours to 550 mg of 99.8 % of the chemical (pure flakes). The dermal primary irritation index (ranging from 0 to eight) after semi-occlusive exposure was 0.83, 1.5, 1.5 and 1.0 after 1, 24, 48 and 72 hours respectively. The average dermal irritation index was 1.21. No scores were noted after five days, indicating reversibility of observed effects. This study concluded the chemical was slightly irritating to the skin.

In an non-guideline study (ECHA, 2013), one male and one female New Zealand white rabbit were exposed to 500mg of the chemical (purity of the chemical not given) applied using semi-occlusive exposure to the inside of the ear (washed off after 24 hours) and observed up to 14 days. There was no observation of oedema or erythema at any time point and the chemical was considered not irritating.

In a previously mentioned non-guideline study regarding acute toxicity via the dermal exposure (IUCLID, 2000; ECHA, 2012) in rabbits, severe skin irritation was seen following 24 hour exposure. Skin changes included pale erythema and superficial second degree burns. Eschar and slight to moderate desquamation was observed at day seven and 14. In this study, both dose and exposure duration were higher than specified in the OECD guidelines for skin irritation.

### Eye Irritation

The chemical is currently classified with the risk phrase ‘Risk of serious eye damage’ (Xi; R41) in Australia (Safe Work Australia—HSIS). Although the animal data do not support this classification, cases of serious eye damage in humans have been observed (refer to **Observation in humans** below) and do support this classification.

In a non-guideline study (OECD, 2005; REACH), one male and one female New Zealand white rabbit were exposed to 50 mg/rabbit of the chemical applied into the conjunctival sac of one eye of each rabbit (washed out after 24 hours) and observed for up to seven days. Average Draize scores were recorded as cornea 1, iris 1, conjunctiva/ redness 2, conjunctival swelling 2 and lacrimation 1. The cornea was temporarily cloudy (up to day two) and all observed effects were reversible within the seven-day observation period, except for conjunctival redness.

### Observation in humans

Human skin irritation cases (OECD, 2005) were reported from occupational exposure with contact to the chemical as either a solid or vapour. Lesions ranged from erythema, blistering, ulcerations to necrosis. Impurities in the chemical were thought to contribute to these symptoms; irritation was greater in summer where perspiration may hydrolyse the chemical.

Effects of eye irritations in humans included conjunctivitis, lacrimation, corneal ulceration, corneal necrosis, and photophobia, following occupational exposure to the chemical (OECD, 2005).

Respiratory irritation from the chemical as a vapour, fume or dust causes coughing, sneezing, burning sensations in the nose and throat and increased mucous secretion. OECD (2005) reported that repeated exposure may cause respiratory irritation resulting in nasal ulceration, bleeding, atrophy of the mucous membranes, loss of smell, hoarseness, bronchitis, urticaria and symptoms of allergic hypersensitivity.

## Sensitisation

### Respiratory Sensitisation

The chemical is classified as hazardous with the risk phrase ‘May cause sensitisation by inhalation’ (R42) in HSIS (Safe Work Australia). The data available support this classification.

In a non-guideline study (OECD, 2005), eight female Dunkin Hartley guinea pigs per group were exposed to the chemical dust at 0.5 or 1.0 mg/m³, and another 16 females were exposed to dust at 5.0 mg/m³. Animals were treated for three hours per day for five consecutive days and then challenged on day 19 with either the chemical dust at 5 mg/m³, or with the chemical conjugated to guinea pig serum albumin dust at 2.0 mg/m³. Linear regression analysis showed a highly significant dose-response relationship for increasing IgG antibodies with increasing exposure concentration. Animals exposed to and challenged with 5.0 mg/m³ of the chemical dust had a high correlation with large numbers of haemorrhagic lung foci on histopathological examination. The immunological response and the histological report indicate the chemical is sensitising to the respiratory system.

Cases of respiratory sensitisation in humans have been observed (refer to **Observation in humans** below).

### Skin Sensitisation

The chemical is classified as hazardous with the risk phrase ‘May cause sensitisation by skin contact’ (R43) in HSIS (Safe Work Australia). The positive results reported in a guinea pig maximisation test using OECD TG 406, as well as a murine local lymph node assay (LLNA) using OECD TG 429 (OECD, 2005), support this classification.

In the guinea pig maximisation test using the OECD TG 406 (OECD, 2005; Basketter and Scholes, 1992), albino Dunkin Hartley guinea pigs were treated with six intradermal injections (0.1 % of the chemical) in the shoulder region to induce sensitisation, and then topically induced 6–8 days later with a 48 hour occluded patch (25 % of the chemical) placed over the injection site. The animals were then challenged on one flank two weeks later with a 24 hour occluded patch (10 % of the chemical) at the maximum non-irritant concentration. Positive responses at 24 hours and 48 hours were found in 90 % of the treated animals, demonstrating that the chemical is a skin sensitiser.

In the murine local lymph node assay (LLNA) using OECD TG 429 (OECD, 2005; Basketter and Scholes, 1992), four CBA/Ca mice were exposed to concentrations of 2.5 %, 5 % and 10 % of the chemical, with daily topical application of 25 µl of each concentration on the dorsal surface of each ear for three consecutive days. Mice were sacrificed on day 4–5, after an injection of [³H] methyl thymidine. The proliferative response of the lymph node cells were greater than 12 times (2.5 % concentration) compared with the control, demonstrating that the chemical is a skin sensitiser.

### Observation in humans

There have been a number of occupational exposure incidences where there is evidence that the chemical causes respiratory sensitisation from work-related rhinitis, chronic bronchitis and work-associated asthma, sometimes with a delayed reaction and influenza-like symptoms. A reported increase in IgG and/or specific IgE levels from the blood are generally associated with exposure to the chemical (OECD, 2005).

Two cases of skin sensitisation from occupational exposure have been reported (OECD, 2005). In one case, urticarical rash on exposed skin was found and, from another study, 14 % of workers had an allergic response to a 0.1 % solution of the chemical in acetone.

In another study, (REACH), following occupational exposure of several months, a 38-year-old man had symptoms of rhinorrhoea, postnasal drip, and wheezing at the plant where the chemical was used as a reagent. Results from a positive skin test, provocative bronchial challenges, and a high serum titre of specific IgE to the chemical, confirmed his clinical hypersensitivity.

## Repeated Dose Toxicity

### Oral

Considering the no observed adverse effect levels (NOAELs) available from 7–105 week rodent studies (500–7140 mg/kg bw/d), and based on the treatment-related effects reported in various repeate dose toxicity studies, the chemical is not considered to cause serious damage to health by repeated oral exposure (REACH; OECD, 2005).

In a 105-week non-guideline study on Fischer 344 rats (REACH, 2013; OECD, 2005), the chemical was administered via diet to 50 animals per sex at doses of 0, 500, 1000 mg/kg bw/day, followed by sacrifice, necropsy and histopathological examination of major organs and tissues.

No statistically significant difference in mortality was observed in any group and there was no clinical difference between the control and test groups of animals. Based on the reduced body weight gain (< 10 %) of the high dose males, the NOAEL in this study was 500 mg/kg bw/day.

The same research group conducted another chronic 105-week study in B6C3F1 mice (REACH; OECD, 2005), in which the chemical was administered via diet to 50 animals per sex at doses of 0, 3570, 7140 mg/kg bw/day for the first 32 weeks, and then reduced to 0, 2340, 4670 mg/kg bw/day for male mice and 1717 or 3430 mg/kg bw/day for female mice. Animals were then sacrificed and underwent necropsy and histopathological examination of major organs and tissues. No significant difference in mortality was observed in any group, although there was a dose-related inhibition of weight gain. The data were examined under the US EPA Integrated Risk Information System which reported that males demonstrated losses of 12–25 % and females of 12–27 % at the lower and higher doses respectively. A dose-related increase in incidences of lung and kidney lymphocytosis, chronic bile duct inflammation, adrenal atrophy and mineralisation of the thalamus was also reported. Based on these results, the LOAEL in this study was 1717 mg/kg bw/day in females and 2340 mg/kg bw/day in males.

In a 7-week study in B6C3F1 mice (REACH, 2013; OECD, 2005), the chemical was administered via diet to five animals per sex at concentrations of 0, 890, 1790, 3570, 7140 mg/kg bw/day, followed by one week of further observations, sacrifice, necropsy and histopathological examination of major organs and tissues. No animals died during the subchronic test, and there were no effects on body weight. Histopathological examination of tissues showed no difference between control and test animals. As no adverse effects were reported at any dose, a NOAEL of 7140 mg/kg bw/day was reported for male and female mice.

### Dermal

No data are available.

### Inhalation

There are no reliable data available due to insufficient documentation and low animal numbers (REACH; OECD, 2005).

## Genotoxicity

The chemical is genotoxic in vitro at extremely high cytotoxic concentrations and only in the absence of metabolic activation systems (OECD, 2005). The genotoxic effect at high cytotoxic concentrations is not expected to be relevant under in vivo conditions due to the rapid hydrolysis of the chemical into phthalic acid.

In an in vitro study similar to OECD TG 471(Bacterial reverse mutation test) in *Salmonella typhimurium* strains TA 98, TA 100, TA 1535, TA 1537, and *Escherichia coli* WP2uvrA at concentrations up to 5000 µg/plate, at concentrations of 313 ug/plate, cytotoxic effects were observed with and without metabolic activation.

In another in vitro study, *Salmonella typhimurium* strains TA 98, TA 100, TA 1535, TA 1537 were exposed to the chemical in a pre-incubation study with and without metabolic activation using rat and hamster liver S9 mix. Results were negative up to 3333.0 ug/plate with S9 mix, and 333 µg/plate (TA 100, TA 1535, TA 1537) or 1000 µg/plate (TA 98) in its absence (OECD 2005).

Another in vitro study following OECD TG 473 (in vitro Mammalian chromosome aberration test) in mammalian Chinese Hamster Ovary (CHO) cells, with and without metabolic activation, there was no increased incidence of structural aberrations up to concentrations of 300 µg/ml (OECD, 2005), although in a second study by the same group, higher doses of the chemical (10 mM) caused an increase in aberrations of 18.5 % compared to control of 3 %, without S9 mix. The positive result is limited in reliability, because the concentration used was cytotoxic (remaining cell counts 29 %) and precipitated out of solution.

In a sister chromatid exchange assay to observe DNA damage and/or repair (OECD, 2005), CHO cells were incubated with the test compound in a range of 10–300 µg/ml with S9 mix for two hours, or without S9 mix for 8−12 hours. The highest concentration was identified in a preliminary study as a cytotoxic level. No significant increase in sister chromatid exchanges were observed at any concentration investigated.

In vivo studies are not available (REACH; OECD, 2005); however, the metabolite, phthalic acid, is reported to be negative in an in vivo mouse micronucleus test (Lee, 2007).

## Carcinogenicity

The chemical was not carcinogenic in rats and mice up to and including the highest dose levels (1000 and 7140 mg/kg bw/day mg/kg bw/d) for rats and mice (OECD, 2005).

In a 105-week non guideline study in Fischer 344 rats (described in the **Repeat dose toxicity oral** section above), there was no difference in frequency or distribution of neoplasms between treated and untreated animals.

For B6C3F1 mice in the chronic 105-week study (described in the **Repeat dose toxicity oral** section above), no neoplastic changes considered to be treatment-related were observed in the mice.

## Reproductive and Developmental Toxicity

The chemical does not show specific reproductive or developmental toxicity. Observed developmental effects were only observed secondary to maternal toxicity.

Effects of the chemical on reproductive organs were reported in the previous chronic 105-week study described in the **Repeat dose toxicity oral** section above. Histopathological examination of major organs and tissues in male rats included preputial gland, prostate, seminal vesicle, testis and epididymis, and in female rats, the mammary gland, uterus, endothelial gland, and ovary. There was no difference observed for any reproductive organs between treated and untreated animals.

In a developmental toxicity study (OECD, 2005), groups of 11 pregnant Wistar rats were fed daily doses of approximately 0, 1000, 1700, 3000 mg/kg bw/day. After daily observations for signs of toxicity, maternal body weight and food consumption, rats were sacrificed on day 20, and body weight and histopathology were performed. Maternal toxicity was seen in the 1700 and 3000 mg/kg bw/day groups as

determined by decreased body weight. No changes in the maternal parameters were found in the low dose group. There were no changes between groups in the incidence of post implantation loss, number and sex ratio of live foetuses. Although there were significant decreases in the weight of male foetuses and decreased numbers of ossified centres of the caudal vertebrae found in the high dose group (3000 mg/kg bw/day), significant maternal toxicity was also observed. There was no observed difference in foetus morphology between the control and treated groups.

# Risk Characterisation

## Critical Health Effects

The critical health effects for risk characterisation are skin and respiratory sensitisation, and serious eye damage. The chemical may also cause local irritation effects.

## Public Risk Characterisation

Given the uses identified for the chemical, public exposure to the chemical is expected to be minimal. Although the use of this chemical as a direct ingredient in domestic products in Australia is not known, international information indicates that it is not likely to be widely available for domestic use. The chemical is used in the manufacture of consumer products, however, due to the rapid hydrolysis of the chemical, it is expected that residual traces of the chemical would only be present in minimal amounts.

The chemical is currently listed on Schedule 5 of the Poisons Schedule if used as a curing agent for epoxy resins. A number of first aid instructions and safety directions relating to skin and eye contact and avoiding breathing the vapour.

Overall, the public risk from this chemical is not considered to be unreasonable.

## Occupational Risk Characterisation

During product formulation, dermal, ocular and inhalation exposure of workers to the chemical may occur, particularly where manual or open processes are used. These may include transfer and blending activities, quality control analysis, and cleaning and maintenance of equipment. The level and route of exposure will vary depending on the method of application and work practices employed.

Given the critical systemic acute and local health effects, the chemical may pose an unreasonable risk to workers unless adequate control measures to minimise dermal, ocular and inhalation exposure to the chemical 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 appropriate controls.

Based on the available data, the hazard classification in HSIS is considered appropriate.

# NICNAS Recommendation

Current risk management measures are considered adequate for the protection of public and workers' health and safety provided that all requirements are met under workplace health and safety and poisons legislation as adopted by the relevant state or territory. No further assessment is required.

## Regulatory Control

Public Health

Products containing the chemical should be labelled in accordance with state and territory legislation (SUSMP).

### 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 hazards and environmental hazards.

| Hazard | Approved Criteria (HSIS)[a] | GHS Classification (HCIS)[b] |
|---|---|---|
| Acute Toxicity | Harmful if swallowed (Xn; R22)* | Harmful if swallowed - Cat. 4 (H302) |
| Irritation / Corrosivity | Risk of serious eye damage (Xi; R41)* Irritating to skin (Xi; R38)* Irritating to respiratory system (Xi; R37)* | Causes serious eye damage - Cat. 1 (H318) Causes skin irritation - Cat. 2 (H315) May cause respiratory irritation - Specific target organ tox, single exp Cat. 3 (H335) |
| Sensitisation | May cause sensitisation by inhalation (Xn, R42)* May cause sensitisation by skin contact (Xi; R43)* | May cause allergy or asthma symptoms or breathing difficulties if inhaled - Cat. 1 (H334) 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, ocular and inhalation 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 which may minimise the risk include, but are not limited to:

- using closed systems or isolating operations;
- using local exhaust ventilation to prevent the chemical from entering the breathing zone of any worker;
- 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 assist with meeting 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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