



Chemwatch Material Safety Data Sheet (REVIEW)

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Section 2 - HAZARDS IDENTIFICATION

**POISONS SCHEDULE**

None

**RISK**

- Flammable.
- Harmful by inhalation and if swallowed.
- Irritating to eyes respiratory system and skin.
- HARMFUL - May cause lung damage if swallowed.
- Vapours may cause drowsiness and dizziness.
- Skin contact may produce health damage\*.
- Cumulative effects may result following exposure\*.
- Repeated exposure potentially causes skin dryness and cracking\*.

\* (limited evidence).

**SAFETY**

- Do not breathe gas/ fumes/ vapour/ spray.
- Avoid contact with eyes.
- Wear suitable protective clothing.
- Use only in well ventilated areas.
- Keep container in a well ventilated place.
- To clean the floor and all objects contaminated by this material use water.
- Keep container tightly closed.
- Keep away from food drink and animal feeding stuffs.
- In case of contact with eyes rinse with plenty of water and contact Doctor or Poisons Information Centre.
- If swallowed IMMEDIATELY contact Doctor or Poisons Information Centre (show this container or label).
- This material and its container must be disposed of as hazardous waste.

**Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS**

NAME	CAS RN	%
n- butanol	71-36-3	30-60
formic acid	64-18-6	0-9.9
water	7732-18-5	30-60

**Section 4 - FIRST AID MEASURES****SWALLOWED**

- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

**EYE**

- If this product comes in contact with the eyes:
  - Immediately hold eyelids apart and flush the eye continuously with running water.
  - Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
  - Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.

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Section 4 - FIRST AID MEASURES

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- Transport to hospital or doctor without delay.
  - Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**SKIN**

- If skin contact occurs:
  - Immediately remove all contaminated clothing, including footwear.
  - Flush skin and hair with running water (and soap if available).
  - Seek medical attention in event of irritation.

**INHALED**

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor, without delay.

**NOTES TO PHYSICIAN**

- Treat symptomatically.
  - To treat poisoning by the higher aliphatic alcohols (up to C7):
    - Gastric lavage with copious amounts of water.
    - It may be beneficial to instill 60 ml of mineral oil into the stomach.
    - Oxygen and artificial respiration as needed.
    - Electrolyte balance: it may be useful to start 500 ml. M/6 sodium bicarbonate intravenously but maintain a cautious and conservative attitude toward electrolyte replacement unless shock or severe acidosis threatens.
    - To protect the liver, maintain carbohydrate intake by intravenous infusions of glucose.
    - Haemodialysis if coma is deep and persistent. [GOSSELIN, SMITH HODGE: Clinical Toxicology of Commercial Products, Ed 5)

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**BASIC TREATMENT**

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- Establish a patent airway with suction where necessary.
- Watch for signs of respiratory insufficiency and assist ventilation as necessary.
- Administer oxygen by non-rebreather mask at 10 to 15 l/min.
- Monitor and treat, where necessary, for shock.
- Monitor and treat, where necessary, for pulmonary oedema.
- Anticipate and treat, where necessary, for seizures.
- DO NOT use emetics. Where ingestion is suspected rinse mouth and give up to 200 ml water (5 ml/kg recommended) for dilution where patient is able to swallow, has a strong gag reflex and does not drool.
- Give activated charcoal.

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**ADVANCED TREATMENT**

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- Consider orotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has occurred.
- Positive-pressure ventilation using a bag-valve mask might be of use.
- Monitor and treat, where necessary, for arrhythmias.
- Start an IV D5W TKO. If signs of hypovolaemia are present use lactated Ringers solution. Fluid overload might create complications.
- If the patient is hypoglycaemic (decreased or loss of consciousness, tachycardia, pallor, dilated pupils, diaphoresis and/or dextrose strip or glucometer readings below 50 mg), give 50% dextrose.
- Hypotension with signs of hypovolaemia requires the cautious administration of fluids. Fluid overload might create complications.
- Drug therapy should be considered for pulmonary oedema.
- Treat seizures with diazepam.
- Proparacaine hydrochloride should be used to assist eye irrigation.

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Section 4 - FIRST AID MEASURES

## EMERGENCY DEPARTMENT

- Laboratory analysis of complete blood count, serum electrolytes, BUN, creatinine, glucose, urinalysis, baseline for serum aminotransferases (ALT and AST), calcium, phosphorus and magnesium, may assist in establishing a treatment regime. Other useful analyses include anion and osmolar gaps, arterial blood gases (ABGs), chest radiographs and electrocardiograph.
  - Positive end-expiratory pressure (PEEP)-assisted ventilation may be required for acute parenchymal injury or adult respiratory distress syndrome.
  - Acidosis may respond to hyperventilation and bicarbonate therapy.
  - Haemodialysis might be considered in patients with severe intoxication.
  - Consult a toxicologist as necessary. BRONSTEIN, A.C. and CURRANCE, P.L. EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994
- For C8 alcohols and above.  
Symptomatic and supportive therapy is advised in managing patients.

**Section 5 - FIRE FIGHTING MEASURES****EXTINGUISHING MEDIA**

- Alcohol stable foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

**FIRE FIGHTING**

- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- If safe, switch off electrical equipment until vapour fire hazard removed.
- Use water delivered as a fine spray to control fire and cool adjacent area.
- Avoid spraying water onto liquid pools.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.

**FIRE/EXPLOSION HAZARD**

- Liquid and vapour are flammable.
- Moderate fire hazard when exposed to heat or flame.
- Vapour forms an explosive mixture with air.
- Moderate explosion hazard when exposed to heat or flame.
- Vapour may travel a considerable distance to source of ignition.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- On combustion, may emit toxic fumes of carbon monoxide (CO).

Combustion products include: carbon dioxide (CO<sub>2</sub>), other pyrolysis products typical of burning organic material.

**FIRE INCOMPATIBILITY**

- None known.

**HAZCHEM**

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Section 5 - FIRE FIGHTING MEASURES

**PERSONAL PROTECTION**

Glasses:

Chemical goggles.

Gloves:

1.NEOPRENE 2.NATURAL RUBBER

Respirator:

Type AE- P Filter of sufficient capacity

**Section 6 - ACCIDENTAL RELEASE MEASURES**

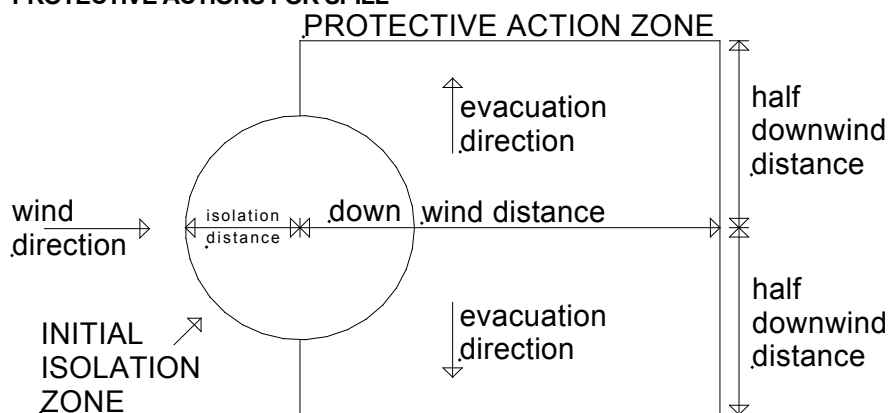
**MINOR SPILLS**

- Slippery when spilt.
- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb small quantities with vermiculite or other absorbent material.
- Wipe up.
- Collect residues in a flammable waste container.

**MAJOR SPILLS**

- Slippery when spilt.
- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse / absorb vapour.
- Contain spill with sand, earth or vermiculite.
- Use only spark-free shovels and explosion proof equipment.
- Collect recoverable product into labelled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

**PROTECTIVE ACTIONS FOR SPILL**



From IERG (Canada/Australia)

Isolation Distance	25 metres
Downwind Protection Distance	300 metres
IERG Number	14

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Section 6 - ACCIDENTAL RELEASE MEASURES

**FOOTNOTES**

1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.

2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.

3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.

4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills".

LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.

5 Guide 128 is taken from the US DOT emergency response guide book.

6 IERG information is derived from CANUTEC - Transport Canada.

**Personal Protective Equipment advice is contained in Section 8 of the MSDS.**

**Section 7 - HANDLING AND STORAGE****PROCEDURE FOR HANDLING**

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of overexposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- Avoid smoking, naked lights or ignition sources.
- Avoid generation of static electricity.
- DO NOT use plastic buckets.
- Earth all lines and equipment.
- Use spark-free tools when handling.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

**SUITABLE CONTAINER**

- Glass container is suitable for laboratory quantities.

**STORAGE INCOMPATIBILITY**

- Avoid oxidising agents, acids, acid chlorides, acid anhydrides, chloroformates.

\*.

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# SOLVENT FOR MALIC ACID BY PC Hazard Alert Code: MODERATE

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Section 7 - HANDLING AND STORAGE

## STORAGE REQUIREMENTS

- Store in original containers in approved flammable liquid storage area.
- Store away from incompatible materials in a cool, dry, well-ventilated area.
- DO NOT store in pits, depressions, basements or areas where vapours may be trapped.
- No smoking, naked lights, heat or ignition sources.
- Storage areas should be clearly identified, well illuminated, clear of obstruction and accessible only to trained and authorised personnel - adequate security must be provided so that unauthorised personnel do not have access.
- Store according to applicable regulations for flammable materials for storage tanks, containers, piping, buildings, rooms, cabinets, allowable quantities and minimum storage distances.
- Use non-sparking ventilation systems, approved explosion proof equipment and intrinsically safe electrical systems.
- Have appropriate extinguishing capability in storage area (e.g. portable fire extinguishers - dry chemical, foam or carbon dioxide) and flammable gas detectors.
- Keep adsorbents for leaks and spills readily available.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

In addition, for tank storages (where appropriate):

- Store in grounded, properly designed and approved vessels and away from incompatible materials.
- For bulk storages, consider use of floating roof or nitrogen blanketed vessels; where venting to atmosphere is possible, equip storage tank vents with flame arrestors; inspect tank vents during winter conditions for vapour/ ice build-up.
- Storage tanks should be above ground and diked to hold entire contents.

## SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



+: *May be stored together*

O: *May be stored together with specific preventions*

X: *Must not be stored together*

## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

### EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m <sup>3</sup>	STEL ppm	STEL mg/m <sup>3</sup>	Peak ppm	Peak mg/m <sup>3</sup>	TWA F/CC	Notes
Australia Exposure Standards	n- butanol (n- Butyl alcohol)					50	152		Sk
Australia Exposure Standards	formic acid (Formic acid)	5	9.4	10	19				

The following materials had no OELs on our records

- water: CAS:7732- 18- 5

### EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
n-butanol		1,400 [LEL]

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**Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION**

formic acid

30 [Unch]

**NOTES**

Values marked LEL indicate that the IDLH was based on 10% of the lower explosive limit for safety considerations even though the relevant toxicological data indicated that irreversible health effects or impairment of escape existed only at higher concentrations.

**ODOUR SAFETY FACTOR (OSF)**

OSF=60 (n-BUTANOL)

■ Exposed individuals are reasonably expected to be warned, by smell, that the Exposure Standard is being exceeded.

Odour Safety Factor (OSF) is determined to fall into either Class A or B.

The Odour Safety Factor (OSF) is defined as:

OSF= Exposure Standard (TWA) ppm/ Odour Threshold Value (OTV) ppm

Classification into classes follows:

Class	OSF	Description
A	550	Over 90% of exposed individuals are aware by smell that the Exposure Standard (TLV- TWA for example) is being reached, even when distracted by working activities
B	26- 550	As " A" for 50- 90% of persons being distracted
C	1- 26	As " A" for less than 50% of persons being distracted
D	0.18- 1	10- 50% of persons aware of being tested perceive by smell that the Exposure Standard is being reached
E	<0.18	As " D" for less than 10% of persons aware of being tested

**MATERIAL DATA**

SOLVENT FOR MALIC ACID BY PC:

Not available

N-BUTANOL:

■ For n-butanol:

Odour Threshold Value: 0.12-3.4 ppm (detection), 1.0-3.5 ppm (recognition)

NOTE: Detector tubes for n-butanol, measuring in excess of 5 ppm are commercially available.

Exposure at or below the TLV-TWA is thought to provide protection against hearing loss due to vestibular and auditory nerve damage in younger workers and to protect against the significant risk of headache and irritation.

25 ppm may produce mild irritation of the respiratory tract 50 ppm may produce headache and vertigo.

Higher concentrations may produce marked irritation, sore throat, coughing, nausea, shortness of breath, pulmonary injury and central nervous system depression characterised by headache, dizziness, dullness and drowsiness.

6000 ppm may produce giddiness, prostration, narcosis, ataxia, and death.

Odour Safety Factor (OSF)

OSF=60 (n-BUTANOL).

Exposed individuals are reasonably expected to be warned, by smell, that the Exposure Standard is being exceeded.

Odour Safety Factor (OSF) is determined to fall into either Class A or B.

The Odour Safety Factor (OSF) is defined as:

OSF= Exposure Standard (TWA) ppm/ Odour Threshold Value (OTV) ppm

Classification into classes follows:

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## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Class	OSF	Description
A	550	Over 90% of exposed individuals are aware by smell that the Exposure Standard (TLV- TWA for example) is being reached, even when distracted by working activities
B	26- 550	As " A" for 50- 90% of persons being distracted
C	1- 26	As " A" for less than 50% of persons being distracted
D	0.18- 1	10- 50% of persons aware of being tested perceive by smell that the Exposure Standard is being reached
E	<0.18	As " D" for less than 10% of persons aware of being tested

### FORMIC ACID:

- for formic acid:

Odour Threshold Value: 20-40 mg/m<sup>3</sup> (detection)

NOTE: Detector tubes for formic acid, measuring in excess of 1 ppm, are available commercially.

The TLV-TWA is thought to be protective against the risk of respiratory and eye irritation and possible skin irritation.

### WATER:

- No exposure limits set by NOHSC or ACGIH.

### PERSONAL PROTECTION



### EYE

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

### HANDS/FEET

- Wear chemical protective gloves, eg. PVC.
- Wear safety footwear or safety gumboots, eg. Rubber.

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**Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION**

**OTHER**

- Overalls.
- PVC Apron.
- PVC protective suit may be required if exposure severe.
- Eyewash unit.
- Ensure there is ready access to a safety shower.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required. For further information consult site specific CHEMWATCH data (if available), or your Occupational Health and Safety Advisor.

**ENGINEERING CONTROLS**

■ For flammable liquids and flammable gases, local exhaust ventilation or a process enclosure ventilation system may be required. Ventilation equipment should be explosion-resistant. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant: solvent, vapours, degreasing etc., evaporating from tank (in still air). aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation) direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	Air Speed: 0.25- 0.5 m/s (50- 100 f/min.)  0.5- 1 m/s (100- 200 f/min.)  1- 2.5 m/s (200- 500 f/min.)
---	--

Within each range the appropriate value depends on:

Lower end of the range 1: Room air currents minimal or favourable to capture 2: Contaminants of low toxicity or of nuisance value only. 3: Intermittent, low production. 4: Large hood or large air mass in motion	Upper end of the range 1: Disturbing room air currents 2: Contaminants of high toxicity 3: High production, heavy use 4: Small hood- local control only
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Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min.) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

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**Section 9 - PHYSICAL AND CHEMICAL PROPERTIES**

**APPEARANCE**

Clear flammable liquid; mixes with water.

**PHYSICAL PROPERTIES**

Mixes with water.

State	LIQUID	Molecular Weight	Not Applicable
Melting Range (°C)	Not Available	Viscosity	Not Available
Boiling Range (°C)	Not Available	Solubility in water (g/L)	Miscible
Flash Point (°C)	29 (n- butanol)	pH (1% solution)	Not Available
Decomposition Temp (°C)	Not Available	pH (as supplied)	Not Available
Autoignition Temp (°C)	Not Available	Vapour Pressure (kPa)	Not Available
Upper Explosive Limit (%)	11.2 (n- butanol)	Specific Gravity (water=1)	Not Available
Lower Explosive Limit (%)	1.4 (n- butanol)	Relative Vapour Density (air=1)	Not Available
Volatile Component (%vol)	Not Available	Evaporation Rate	Not Available
n- butanol			
■ log Kow (Prager 1995):		0.88	
■ log Kow (Sangster 1997):		0.84	

**Section 10 - CHEMICAL STABILITY**

**CONDITIONS CONTRIBUTING TO INSTABILITY**

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

*For incompatible materials - refer to Section 7 - Handling and Storage.*

**Section 11 - TOXICOLOGICAL INFORMATION**

**POTENTIAL HEALTH EFFECTS**

**ACUTE HEALTH EFFECTS**

**SWALLOWED**

■ Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual. Overexposure to non-ring alcohols causes nervous system symptoms. These include headache, muscle weakness and inco-ordination, giddiness, confusion, delirium and coma. Digestive symptoms may include nausea, vomiting and diarrhoea. Aspiration is much more dangerous than ingestion because lung damage can occur and the substance is absorbed into the body. Alcohols with ring structures and secondary and tertiary alcohols cause more severe symptoms, as do heavier alcohols. Central nervous system (CNS) depression may include general discomfort, symptoms of giddiness, headache, dizziness, nausea, anaesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness. Serious poisonings may result in respiratory depression and may be fatal.

**EYE**

■ The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

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Section 11 - TOXICOLOGICAL INFORMATION

**SKIN**

■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

**INHALED**

■ Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be harmful.

Aliphatic alcohols with more than 3-carbons cause headache, dizziness, drowsiness, muscle weakness and delirium, central depression, coma, seizures and behavioural changes. Secondary respiratory depression and failure, as well as low blood pressure and irregular heart rhythms, may follow. Nausea and vomiting are seen, and liver and kidney damage is possible as well following massive exposures. Symptoms are more acute the more carbons there are in the alcohol.

Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by sleepiness, reduced alertness, loss of reflexes, lack of co-ordination, and vertigo.

If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Inhalation of high concentrations of gas/vapour causes lung irritation with coughing and nausea, central nervous depression with headache and dizziness, slowing of reflexes, fatigue and inco-ordination.

**CHRONIC HEALTH EFFECTS**

■ Principal routes of exposure are by accidental skin and eye contact and by inhalation of vapours especially at higher temperatures.

As with any chemical product, contact with unprotected bare skin; inhalation of vapour, mist or dust in work place atmosphere; or ingestion in any form, should be avoided by observing good occupational work practice.

**TOXICITY AND IRRITATION**

FORMIC ACID:

N-BUTANOL:

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

■ The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

■ Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

■ Not available. Refer to individual constituents.

N-BUTANOL:

**TOXICITY**

Oral (rat) LD50: 790 mg/kg

Inhalation (human) TClO: 25 ppm

**IRRITATION**

Skin (rabbit): 405 mg/24h- Moderate

Eye (human): 50 ppm - Irritant

continued...

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## Section 11 - TOXICOLOGICAL INFORMATION

Inhalation (rat) LC50: 8000 ppm/4h

Dermal (rabbit) LD50: 3400 mg/kg

Inhalation (human) TLo: 86000 mg/m<sup>3</sup>

■ The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

Eye (rabbit): 1.6 mg- SEVERE

Eye (rabbit): 24 mg/24h- SEVERE

FORMIC ACID:

TOXICITY

Oral (rat) LD50: 1100 mg/kg

Inhalation (rat) LC50: 15000 mg/m<sup>3</sup>/15m

Intravenous (Rabbit) LD: 239 mg/kg

Oral (Human) TLo: 2200 mg/kg

Oral (Mouse) LD50: 700 mg/kg

Intraperitoneal (Mouse) LD50: 940 mg/kg

Intravenous (Mouse) LD50: 145 mg/kg

Oral (Human) LD: 2.44 mg/kg

■ The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

IRRITATION

Skin (rabbit): 610 (open) - Mild

Eye (rabbit): 122 mg - SEVERE

WATER:

■ No significant acute toxicological data identified in literature search.

### SKIN

n- butanol

ND

Notes

Sk

## Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

N-BUTANOL:

FORMIC ACID:

SOLVENT FOR MALIC ACID BY PC:

■ DO NOT discharge into sewer or waterways.

N-BUTANOL:

■ Fish LC50 (96hr.) (mg/l):	1910- 1940
■ Daphnia magna EC50 (48hr.) (mg/l):	1983
■ Algae IC50 (72hr.) (mg/l):	650
■ log Kow (Prager 1995):	0.88
■ log Kow (Sangster 1997):	0.84
■ log Pow (Verschueren 1983):	0.88
■ Half- life Soil - High (hours):	168
■ Half- life Soil - Low (hours):	24
■ Half- life Air - High (hours):	87.7
■ Half- life Air - Low (hours):	8.8
■ Half- life Surface water - High (hours):	168
■ Half- life Surface water - Low (hours):	24
■ Half- life Ground water - High (hours):	1296
■ Half- life Ground water - Low (hours):	48
■ Aqueous biodegradation - Aerobic - High (hours):	168
■ Aqueous biodegradation - Aerobic - Low (hours):	24
■ Aqueous biodegradation - Anaerobic - High (hours):	1296
■ Aqueous biodegradation - Anaerobic - Low (hours):	96

continued...

# SOLVENT FOR MALIC ACID BY PC Hazard Alert Code: MODERATE

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**Section 12 - ECOLOGICAL INFORMATION**

■ Aqueous biodegradation - Removal secondary treatment - High (hours):	99%
■ Aqueous biodegradation - Removal secondary treatment - Low (hours):	31%
■ Photooxidation half- life water - High (hours):	104000
■ Photooxidation half- life water - Low (hours):	2602
■ Photooxidation half- life air - High (hours):	87.7
■ Photooxidation half- life air - Low (hours):	8.8

log Kow: 0.88

Koc: 71.6

Half-life (hr) air: 5-52

Half-life (hr) H2O surface water: 2.4-3022

Henry's atm m<sup>3</sup> /mol: 5.57E-06

BOD 5 if unstated: 1.1-2.04,33%

COD: 1.9,92%

ThOD: 2.594

Fish: LD100 (24 h): 1.4 g/L

Fish LC50 (96 h ): 1.91g/L

Toxicity invertebrate: cell mult. inhib.8-650mg/L

Bioaccumulation: not sig

Nitrif. inhib.: 50% inhib at 8200mg/L

Effects on algae and plankton: cell mult. inhib.100-875mg/L

Degradation Biological: sig

processes Abiotic: RxnOH\*

**FORMIC ACID:**

■ Prevent, by any means available, spillage from entering drains or water courses.

■ for formic acid (and formates)

• In the atmosphere, formic acid reacts with photochemically produced hydroxyl radicals (half-life 34 days).

• Formic acid is highly soluble in water, it is non-persistent (half-life 2-20 days).

• Leaches into some soils where it is expected to be biodegradable.

• Does not concentrate in food chain.

log Kow: -1.55- -0.22

BOD 5 if unstated: 0.02-0.27

ThOD: 0.35

BCF: 0.22

Degradation Biological: sig

processes Abiotic: RxnOH\*

**Ecotoxicity**

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
n- butanol	LOW	MED	LOW	HIGH
formic acid	HIGH		HIGH	HIGH
water	LOW		LOW	HIGH

**Section 13 - DISPOSAL CONSIDERATIONS**

- Consult manufacturer for recycling options and recycle where possible .
- Consult State Land Waste Management Authority for disposal.
- Incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorised landfill.

continued...

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**Section 14 - TRANSPORTATION INFORMATION**



Labels Required: FLAMMABLE LIQUID

**HAZCHEM:**

●3Y (ADG7)

**Land Transport UNDG:**

Class or division: 3      Subsidiary risk: None  
 UN No.: 1993      UN packing group: III  
 Shipping Name: FLAMMABLE LIQUID, N.O.S. (contains n-butanol)

**Air Transport IATA:**

ICAO/IATA Class:	3	ICAO/IATA Subrisk:	None
UN/ID Number:	1993	Packing Group:	III
Special provisions:	A3		
Cargo Only			
Packing Instructions:	310	Maximum Qty/Pack:	220 L
Passenger and Cargo			
Packing Instructions:	309	Maximum Qty/Pack:	60 L
Passenger and Cargo Limited Quantity			
Packing Instructions:	Y309	Maximum Qty/Pack:	10 L

Shipping Name: FLAMMABLE LIQUID, N.O.S. \*(CONTAINS N-BUTANOL)

**Maritime Transport IMDG:**

IMDG Class: 3      IMDG Subrisk: None  
 UN Number: 1993      Packing Group: III  
 EMS Number: F-E , S-E      Special provisions: 223 274 955  
 Limited Quantities: 5 L  
 Shipping Name: FLAMMABLE LIQUID, N.O.S.(contains n-butanol)

**Section 15 - REGULATORY INFORMATION**

**POISONS SCHEDULE**

None

**REGULATIONS**

Regulations for ingredients

**n-butanol (CAS: 71-36-3) is found on the following regulatory lists;**

"Australia Exposure Standards", "Australia Hazardous Substances", "Australia High Volume Industrial Chemical List (HVICL)", "Australia Inventory of Chemical Substances (AICS)", "GESAMP/EHS Composite List - GESAMP Hazard Profiles", "IMO IBC Code Chapter 18: List of products to which the Code does not apply", "IMO MARPOL 73/78 (Annex II) - List of Other Liquid Substances", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals"

continued...

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Section 15 - REGULATORY INFORMATION

**formic acid (CAS: 64-18-6) is found on the following regulatory lists;**

"Australia Exposure Standards", "Australia Hazardous Substances", "Australia Illicit Drug Reagents/Essential Chemicals - Category III", "Australia Inventory of Chemical Substances (AICS)", "Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Appendix E (Part 2)", "Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Appendix F (Part 3)", "Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 5", "GESAMP/EHS Composite List - GESAMP Hazard Profiles", "IMO IBC Code Chapter 17: Summary of minimum requirements", "IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals"

**water (CAS: 7732-18-5) is found on the following regulatory lists;**

"Australia Inventory of Chemical Substances (AICS)", "IMO IBC Code Chapter 18: List of products to which the Code does not apply", "OECD Representative List of High Production Volume (HPV) Chemicals"

**No data for Solvent For Malic Acid By PC (CW: 4647-1)****Section 16 - OTHER INFORMATION****EXPOSURE STANDARD FOR MIXTURES**

■ "Worst Case" computer-aided prediction of spray/ mist or fume/ dust components and concentration:

■ Composite Exposure Standard for Mixture (TWA) :100 mg/m<sup>3</sup>.

■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:

[www.chemwatch.net/references](http://www.chemwatch.net/references).

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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*This is the end of the MSDS.*