

2-Furaldehyde

sc-213812



The Power is Question

Material Safety Data Sheet

Hazard Alert
Code Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
2-Furaldehyde

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Santa Cruz Biotechnology, Inc.
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EMERGENCY

ChemWatch
Within the US & Canada: 877-715-9305
Outside the US & Canada: +800 2436 2255
(1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS

C5-H4-O2, 2-furancarboxaldehyde, 2-furaldehyde, fural, 2-furaldehyde, 2-furancarboxal, furfuraldehyde, 2-furyl-methanal, "pyromucic aldehyde", "bran oil", "artificial oil of ants", "improperly named furfurol"

Section 2 – HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability:	3	
Toxicity:	3	
Body Contact:	2	
Reactivity:	2	
Chronic:	2	

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4



CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Harmful in contact with skin.

Limited evidence of a carcinogenic effect.

HARMFUL – May cause lung damage if swallowed.

Toxic by inhalation and if swallowed.

Irritating to eyes and respiratory system.

Flammable.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Toxic effects may result from the accidental ingestion of the material; animal experiments indicate that ingestion of less than 40 gram may be fatal or may produce serious damage to the health of the individual.

■ Swallowing of the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis; serious consequences may result.

(ICSC13733).

■ Ingestion of furfural (syn: 2-furaldehyde) may cause numbness of the tongue and mucous membranes of the mouth, absence of taste sense, difficulty in breathing, nausea, vomiting and severe headache.

As little as 0.

EYE

■ This material may produce eye irritation in some persons and produce eye damage 24 hours or more after instillation. Moderate inflammation may be expected with redness; conjunctivitis may occur with prolonged exposure.

SKIN

■ Skin contact with the material may be harmful; systemic effects may result following absorption.

■ There is some evidence to suggest that the material may cause moderate inflammation of the skin either following direct contact or after a delay of some time.

Repeated exposure can cause contact dermatitis which is characterized by redness, swelling and blistering.

■ Open cuts, abraded or irritated skin should not be exposed to this material.

■ 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.

■ There is strong evidence to suggest that this material, on a single contact with skin, can cause irreversible damage of organs.

■ Photosensitization designates an abnormal adverse reaction to ultraviolet (UV) and/or visible radiation and is used to describes phototoxic reactions (those having a non-immunological basis), photoallergic reactions (those having an immunological basis) and other, as yet, unexplained reactions of the skin and eyes to sunlight.

INHALED

■ The material can cause respiratory irritation in some persons.

The body's response to such irritation can cause further lung damage.

■ Furfural vapours and mists irritate the nose and throat.

Low levels of vapour (1.

■ Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects; these may be fatal.

CHRONIC HEALTH EFFECTS

■ There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment.

Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

There is limited evidence that, skin contact with this product is more likely to cause a sensitization reaction in some persons compared to the general population.

Chronic effects of furfural include eczema, allergic sensitisation and photosensitisation in certain individuals.

Repeated or prolonged skin contact may stain the skin yellow brown. Chronic respiratory or skin diseases are aggravated by long term exposure. [Genium / CCINFO].

There is strong evidence to suggest that this material, on a single contact with skin, can cause irreversible damage of organs.

Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
furfural	98-01-1	100

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.

- Avoid giving milk or oils.
- Avoid giving alcohol.
- If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.

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.

SKIN

■ If skin contact occurs:

- Immediately remove all contaminated clothing, including footwear
- Flush skin and hair with running water (and soap if available).

INHALED

■

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.

NOTES TO PHYSICIAN

■ Any material aspirated during vomiting may produce lung injury. Therefore emesis should not be induced mechanically or pharmacologically.
for simple aldehydes.

-----BASIC

TREATMENT

- Establish a patent airway with suction where necessary.
- Watch for signs of respiratory insufficiency and assist ventilation as necessary.

BIOLOGICAL EXPOSURE INDEX – BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant Index Sampling Time Comment

Total furoic acid 200 mg/gm End of shift
in urine creatinine

Section 5 – FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	2.025 @ 20 deg.C
Upper Explosive Limit (%):	19.3
Specific Gravity (water=1):	1.16
Lower Explosive Limit (%):	2.1

EXTINGUISHING MEDIA

■

- Water spray or fog.
- Foam.

FIRE FIGHTING

■

- Alert Emergency Responders and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves for fire only.

When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 500 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

■

- Liquid and vapor are flammable.
- Moderate fire hazard when exposed to heat or flame.

Combustion products include: carbon monoxide (CO), carbon dioxide (CO₂), other pyrolysis products typical of burning organic material.

May emit poisonous fumes.

WARNING: Long standing in contact with air and light may result in the formation of potentially explosive peroxides.

FIRE INCOMPATIBILITY

■ Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

1. BUTYL/NEOPRENE 2. PE/EVAL/PE

Respirator:

Type A Filter of sufficient capacity

Section 6 – ACCIDENTAL RELEASE MEASURES

MINOR SPILLS



- Remove all ignition sources.
- Clean up all spills immediately.

MAJOR SPILLS



- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.

Section 7 – HANDLING AND STORAGE

PROCEDURE FOR HANDLING



- DO NOT allow clothing wet with material to stay in contact with skin
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Containers, even those that have been emptied, may contain explosive vapours.
- Do NOT cut, drill, grind, weld or perform similar operations on or near containers.

RECOMMENDED STORAGE METHODS



- Lined metal can, Lined metal pail/drum
- Plastic pail

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

All inner and sole packagings for substances that have been assigned to Packaging Groups I or II on the basis of inhalation toxicity criteria, must be hermetically sealed.

STORAGE REQUIREMENTS

■ Storage of furfural (syn: 2-furaldehyde) in air for extended periods is not recommended because polymer formation, darkening of colour and increases in acidity can occur. Storage under an inert gas such as nitrogen is recommended. Violent polymerisation can occur upon contact with strong mineral acids, alkalis or at elevated temperatures.

Polymerization may occur slowly at room temperature.

Store under an inert gas, e.g. argon or nitrogen.

- Store in original containers.
- Keep containers securely sealed.

Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	Peak ppm	Peak mg/m ³	TWA F/CC	Notes
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Canada – Alberta Occupational Exposure Limits	furfural (Furfural)	2	7.9		
Canada – British Columbia Occupational Exposure Limits	furfural (Furfural)	2			Skin
US ACGIH Threshold Limit Values (TLV)	furfural (Furfural)	2			TLV Basis: upper respiratory tract & eye irritation. BEI
Canada – Quebec Permissible Exposure Values for Airborne Contaminants (English)	furfural (Furfural)	2	7,9		
US OSHA Permissible Exposure Levels (PELs) – Table Z1	furfural (Furfural)	5	20		
US – Minnesota Permissible Exposure Limits (PELs)	furfural (Furfural)	2	8		
US – Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	furfural (Furfural)	5	20		
US – Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	furfural (Furfural)	2	8		
US – Tennessee Occupational Exposure Limits – Limits For Air Contaminants	furfural (Furfural)	2	8		
US – California Permissible Exposure Limits for Chemical Contaminants	furfural (Furfural)	2	8		
US – Idaho – Limits for Air Contaminants	furfural (Furfural)	5	20		
US – Hawaii Air Contaminant Limits	furfural (Furfural)	2	8		
US – Alaska Limits for Air Contaminants	furfural (Furfural)	2	8		
Canada – Saskatchewan Occupational Health and Safety Regulations – Contamination Limits	furfural (Furfural)	2		4	Skin
Canada – Yukon Permissible Concentrations for Airborne Contaminant Substances	furfural (Furfural – Skin)	5	20	15	60
US – Washington Permissible exposure limits of air contaminants	furfural (Furfural)	2		4	
US – Michigan Exposure Limits for Air Contaminants	furfural (Furfural)	2	8		
Canada – Prince Edward Island Occupational Exposure Limits	furfural (Furfural)	2			TLV Basis: upper respiratory tract & eye irritation. BEI
US – Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	furfural (Furfural)	5	20		
Canada – Nova Scotia Occupational Exposure Limits	furfural (Furfural)	2			TLV Basis: upper respiratory tract & eye irritation. BEI

US – Oregon Permissible Exposure Limits (Z-1)	furfural (Furfural)	5	20		
Canada – Northwest Territories Occupational Exposure Limits (English)	furfural (Furfural – Skin)	2	8	10	39

PERSONAL PROTECTION



RESPIRATOR

Type A Filter of sufficient capacity
Consult your EHS staff for recommendations

EYE

- Safety glasses with side shields.
- Chemical goggles.

HANDS/FEET

■ Wear chemical protective gloves, eg. PVC.

NOTE: The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly.

Application of a non-perfumed moisturiser is recommended.

OTHER



- Overalls.
- Eyewash unit.
- Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity.
- For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets), non sparking safety footwear.

ENGINEERING CONTROLS

■ Local exhaust ventilation usually required. If risk of overexposure exists, wear an approved respirator.

Section 9 – PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.

Does not mix with water.

Sinks in water.

Toxic or noxious vapours/gas.

State	Liquid	Molecular Weight	96.09
Melting Range (°F)	-34	Viscosity	Not Available
Boiling Range (°F)	322 – 324	Solubility in water (g/L)	Partly miscible
Flash Point (°F)	140F lost cup.	pH (1% solution)	Not available

Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	601	Vapor Pressure (mmHg)	2.025 @ 20 deg.C
Upper Explosive Limit (%)	19.3	Specific Gravity (water=1)	1.16
Lower Explosive Limit (%)	2.1	Relative Vapor Density (air=1)	3.31
Volatile Component (%vol)	100	Evaporation Rate	<1 BuAc=1
Gas group	IIB		
furfural			
	log Kow (Sangster 1997):		0.46

APPEARANCE

Colourless oily liquid with almond-like odour; slightly soluble in water (8.3% @ 20 deg.C). Miscible with alcohol, ether and benzene. Turns reddish brown on exposure to air and light.

Section 10 – CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY



- Presence of elevated temperatures.
- Presence of air
- Presence of incompatible materials.
- Product is considered stable.

Violent polymerisation can occur upon contact with strong mineral acids, alkalis or at elevated temperatures.

STORAGE INCOMPATIBILITY

■ For furfural:

- Strong acids or bases may cause polymerisation.
- Reacts violently with strong acids, alkalis, sodium bicarbonate.
- Incompatible with ammonia, aliphatic amines, alkanolamines. aromatic amines.
- Attacks many plastics, coatings.
- Avoid strong acids, bases.

Avoid reaction with oxidizing agents.

For incompatible materials – refer to Section 7 – Handling and Storage.

Section 11 – TOXICOLOGICAL INFORMATION

furfural

TOXICITY AND IRRITATION

FURFURAL:

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

TOXICITY	IRRITATION
Oral (rat) LD50: 65 mg/kg	Skin (rabbit): 20 mg/24h Moderate
Inhalation (human) TLo: 0.310 mg/m ³	Eye (rabbit): 100 mg/24h Moderate
Inhalation (rat) LC50: 175 ppm/6h	
Dermal (rabbit) LDLo: 620 mg/kg	

■ 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.

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.

Carcinogenic by RTECS criteria (oral mouse liver tumors)

Substance has been investigated as a mutagen;

Human sister chromatid exchange in lymphocytes observed at 70 micromol/litre

Single- and repeated dose animal toxicity studies in the open literature, using various routes and animal species, give evidence of adverse effects involving most physiological systems including respiratory system, liver and kidney, blood and bone marrow as well as adverse effects to the nervous system.

Studies in humans and animals show that furfural is readily absorbed and is excreted in the urine.

The very sparse human toxicological data indicate that the main effect of furfural is eye and mucous membrane irritation observed after exposure to furfural vapour in concentrations of 20–64 mg/m³.

In animals, furfural has a relatively high degree of toxicity. An LC50-value of 175 ppm (700 mg/m³) for 6 hours exposure has been reported in rat. Oral LD50-values reported are in the range from 65 to 149 mg/kg in the rat.

Repeated exposure of hamsters to furfural vapour by inhalation caused irritation of the eyes and nose, and hyperplastic atrophy of the nasal olfactory epithelium. A NOAEL of 77 mg/m³ (6 hours/day, 5 days/week for 13 weeks) was considered. In oral subchronic and chronic studies, furfural were primarily associated with hepatic effects. For rats, the most sensitive animal, a LOAEL of 11 mg/kg/day (5 days/week) was considered.

Mutagenic and genotoxic effects

Furfural exhibits an inconsistent pattern of genotoxic activity, being generally negative in bacterial assays but positive in some eukaryotic systems. Neither chromosomal aberrations nor sister chromatid exchanges were observed in bone-marrow cells of mice treated with furfural in vivo. Gene mutation (in a single study), sister chromatid exchanges and chromosomal aberrations were induced in mammalian cells in vitro. Sex-linked recessive lethal mutations were induced in fruit fly.

Carcinogenicity

Furfural has been tested for carcinogenicity by oral administration in rats and mice. In mice, increased incidences (statistically significant in the high dose group of 175 mg/kg/day) of hepatocellular adenomas and carcinomas (males only) were observed. An increased incidence (not statistically significant) of forestomach papillomas were observed in female mice. Male rats had a low incidence of cholangiocarcinomas, which occur rarely.

There was no evidence of furfural possessing carcinogenic or co-carcinogenic activity in hamsters exposed to furfural vapour for 52 weeks.

CARCINOGEN

	US – Rhode Island Hazardous Substance List	IARC	
FURFURAL	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	CPDB
VPVB_(VERY~	US – Maine Chemicals of High Concern List	Carcinogen	CA Prop 65; IARC; NTP 11th ROC

SKIN

furfural	US – Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants – Skin	Skin Designation	X
furfural	US – Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants – Skin	Skin Designation	X
furfural	US – Washington Permissible exposure limits of air contaminants – Skin	Skin	X
furfural	US – Tennessee Occupational Exposure Limits – Limits For Air Contaminants – Skin	Skin Designation	X
furfural	US – Minnesota Permissible Exposure Limits (PELs) – Skin	Skin Designation	X
furfural	US – Hawaii Air Contaminant Limits – Skin Designation	Skin Designation	X
furfural	US OSHA Permissible Exposure Levels (PELs) – Skin	Skin Designation	X
furfural	Canada – Alberta Occupational Exposure Limits – Skin	Substance Interaction	1, 3

Section 12 – ECOLOGICAL INFORMATION

This material and its container must be disposed of as hazardous waste.

Ecotoxicity Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
furfural	LOW		LOW	HIGH

Section 13 – DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

A. General Product Information

Ignitability characteristic: use EPA hazardous waste number D001 (waste code I)

B. Component Waste Numbers

When furfural is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U125 (waste code I).

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

! Puncture containers to prevent re-use and bury at an authorized landfill.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common – the user should investigate:

- Reduction

- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate. DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.

Section 14 – TRANSPORTATION INFORMATION



DOT:

Symbols:	None	Hazard class or Division:	6.1
Identification Numbers:	UN1199	PG:	II
Label Codes:	6.1, 3	Special provisions:	IB2, T7, TP2
Packaging: Exceptions:	153	Packaging: Non-bulk:	202
Packaging: Exceptions:	153	Quantity limitations: Passenger aircraft/rail:	5 L
Quantity Limitations: Cargo aircraft only:	60 L	Vessel stowage: Location:	A
Vessel stowage: Other:	None		

Hazardous materials descriptions and proper shipping names:

Furaldehydes

Air Transport IATA:

ICAO/IATA Class:	6.1 (3)	ICAO/IATA Subrisk:	None
UN/ID Number:	1199	Packing Group:	II
Special provisions:	None		

Cargo Only

Packing Instructions:	60 L	Maximum Qty/Pack:	5 L
Passenger and Cargo		Passenger and Cargo	
Packing Instructions:	662	Maximum Qty/Pack:	654
Passenger and Cargo Limited Quantity		Passenger and Cargo Limited Quantity	
Packing Instructions:	1 L	Maximum Qty/Pack:	Y641

Shipping Name: FURALDEHYDES

Maritime Transport IMDG:

IMDG Class:	6.1	IMDG Subrisk:	3
UN Number:	1199	Packing Group:	II
EMS Number:	F-E, S-D	Special provisions:	None

Limited Quantities: 100 ml

Shipping Name: FURALDEHYDES 1199

Section 15 – REGULATORY INFORMATION

furfural (CAS: 98-01-1) is found on the following regulatory lists:

"Canada – Alberta Occupational Exposure Limits", "Canada – British Columbia Occupational Exposure Limits", "Canada – Northwest Territories Occupational Exposure Limits (English)", "Canada – Nova Scotia Occupational Exposure Limits", "Canada – Prince Edward Island Occupational Exposure Limits", "Canada – Prince Edward Island Occupational Exposure Limits – Carcinogens", "Canada – Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada – Saskatchewan Occupational Health and Safety Regulations – Contamination Limits", "Canada – Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada Domestic Substances List

(DSL)", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada Toxicological Index Service – Workplace Hazardous Materials Information System – WHMIS (English)", "IMO IBC Code Chapter 17: Summary of minimum requirements", "IMO MARPOL 73/78 (Annex II) – List of Noxious Liquid Substances Carried in Bulk", "International Agency for Research on Cancer (IARC) – Agents Reviewed by the IARC Monographs", "International Fragrance Association (IFRA) Survey: Transparency List", "OECD Representative List of High Production Volume (HPV) Chemicals", "US – Alaska Limits for Air Contaminants", "US – California Occupational Safety and Health Regulations (CAL/OSHA) – Hazardous Substances List", "US – California Permissible Exposure Limits for Chemical Contaminants", "US – Connecticut Hazardous Air Pollutants", "US – Hawaii Air Contaminant Limits", "US – Idaho – Limits for Air Contaminants", "US – Massachusetts Oil & Hazardous Material List", "US – Michigan Exposure Limits for Air Contaminants", "US – Minnesota Hazardous Substance List", "US – Minnesota Permissible Exposure Limits (PELs)", "US – New Jersey Right to Know Hazardous Substances", "US – Oregon Permissible Exposure Limits (Z-1)", "US – Pennsylvania – Hazardous Substance List", "US – Rhode Island Hazardous Substance List", "US – Tennessee Occupational Exposure Limits – Limits For Air Contaminants", "US – Vermont Hazardous wastes which are Discarded Commercial Chemical Products or Off-Specification Batches of Commercial Chemical Products or Spill Residues of Either", "US – Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US – Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US – Washington Discarded Chemical Products List – ""U"" Chemical Products", "US – Washington Permissible exposure limits of air contaminants", "US – Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants", "US ACGIH Threshold Limit Values (TLV)", "US ACGIH Threshold Limit Values (TLV) – Carcinogens", "US CWA (Clean Water Act) – List of Hazardous Substances", "US CWA (Clean Water Act) – Reportable Quantities of Designated Hazardous Substances", "US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities – Hazardous Substances Other Than Radionuclides", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA High Production Volume Program Chemical List", "US EPA Master Testing List – Index I Chemicals Listed", "US FDA Indirect Food Additives: Adhesives and Components of Coatings – Substances for Use Only as Components of Adhesives – Adhesives", "US Food Additive Database", "US List of Lists – Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act", "US OSHA Permissible Exposure Levels (PELs) – Table Z1", "US RCRA (Resource Conservation & Recovery Act) – List of Hazardous Wastes", "US Toxic Substances Control Act (TSCA) – Inventory", "US TSCA Section 8 (a) – Preliminary Assessment Information Rules (PAIR) – Reporting List", "US TSCA Section 8 (d) – Health and Safety Data Reporting"

Section 16 – OTHER INFORMATION

Reasonable care has been taken in the preparation of this information, but the author makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

■ 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.

■ 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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