Phenyl ether-biphenyl eutectic

sc-234792

Material Safety Data Sheet

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
Phenyl ether-biphenyl eutectic

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA

SUPPLIER
Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800

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
C12-H10.C12-H10-O, (C6H5)2.(C6H5)2O, "biphenyl mixed with biphenyl oxide (3:7)", "diphenyl mixed with diphenyl oxide", "1, 1-biphenyl mixed with 1, 1-oxybis(benzene)", "phenyl ether-diphenyl mixture", Dowtherm, "Dowtherm A", Dinil, Diphyl, Gilotherm, "Santotherm VP-1"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability:	1	
Toxicity:	2	
Body Contact:	2	
Reactivity:	1	
Chronic:	2	

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

CANADIAN WHMIS SYMBOLS

EMERGENCY OVERVIEW

RISK

Irritating to eyes, respiratory system and skin.
Repeated exposure may cause skin dryness and cracking.
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Accidental ingestion of the material may be damaging to the health of the individual.
■ Biphenyl is absorbed by the gastro-intestinal tract and is rapidly metabolised to 4-hydroxybiphenyl, 4-phenylcatechol and 4,4'-dihydroxyphenyl which are excreted in the bile as the glucuronide and mercapturic conjugates.
After single large oral doses experimental animals showed increased rate of respiration, lachrymation, anorexia and weight loss, muscular weakness and ataxia, with death in coma occurring between 2 hours and 18 days.

EYE

■ Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals.
Prolonged eye contact may cause inflammation characterized by a temporary redness of the conjunctiva (similar to windburn).
■ The liquid produces a high level of eye discomfort and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

SKIN

■ The material may cause mild but significant 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.
■ Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.
■ 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.

INHALED

■ The material can cause respiratory irritation in some persons.
The body's response to such irritation can cause further lung damage.
■ Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual.
■ Inhalation hazard is increased at higher temperatures.
■ Workers exposed to biphenyl vapour during paper impregnation complained of transient nausea, vomiting and bronchitis.
When air concentrations of biphenyls were below 1 mg/m3 there was no detectable difference between exposed and unexposed workers in blood pressure, pulmonary function tests, serum creatinine values, urinary protein levels and standard blood cell counts.

CHRONIC HEALTH EFFECTS

■ Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.
There has been some concern that this material can cause cancer or mutations but there is not enough data to make an assessment.
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.
Workers exposed chronically to high levels of biphenyl dust and vapours (up to 123 mg/m3 for 10 years) complained of headache, fatigue, abdominal pain with nausea or diarrhoea and various symptoms of polyneuritis.
Neurological examination revealed varying degrees of damage to the central and peripheral nervous systems (decreased conduction velocities, increased sensory thresholds and EEG and EMG abnormalities. Re-examination of several of the workers after 2 years removed from exposure revealed further neural degeneration.
Diphenyl-containing compounds appear to be actively absorbed by the skin of all test animals in which studies were conducted. Toxic effects involve changes in the heart, liver and kidneys.
When introduced by other routes (inhalation or subcutaneous injection), postmortem evidence shows injury to liver, kidneys, myocardium and lungs following lethal exposure.
[Deichmann etal, Journal of Industrial Hygiene and Toxicology, 29, pp 1-13 1947].
Prolonged or repeated skin contact may cause drying with cracking,irritation and possible dermatitis following.
Polycyclic aromatic hydrocarbons are found in a number of materials such as coal tar, tobacco smoke, petroleum and air pollution. Some substituted derivatives have been identified as extremely liable to cause cancer, especially that of the lung and genito-urinary tract.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
phenyl ether	101-84-8	70~
biphenyl	92-52-4	30~

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.

EYE

■ If this product comes in contact with the eyes: · Wash out immediately with fresh 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

■ Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	0.075 @ 25C
Upper Explosive Limit (%):	6.2 @ 260 C
Specific Gravity (water=1):	1.06 @ 25 C
Lower Explosive Limit (%):	0.5 @ 260 C

EXTINGUISHING MEDIA

· Foam.
· Dry chemical powder.

FIRE FIGHTING

· Alert Emergency Responders and tell them location and nature of hazard.
· Wear full body protective clothing with breathing apparatus.
When any large container (including road and rail tankers) is involved in a fire,
consider evacuation by 100 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

· Combustible.
· Slight fire hazard when exposed to heat or flame.
Combustion products include: carbon dioxide (CO_2), other pyrolysis products typical of burning organic material.
May emit clouds of acrid smoke.

FIRE INCOMPATIBILITY

■ Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids,chlorine bleaches, pool chlorine etc. as ignition may result.
Contamination with water may cause foaming in use.

PERSONAL PROTECTION

Glasses:
Safety Glasses.
Chemical goggles.
Gloves:
Respirator:
Type A-P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
■ Environmental hazard - contain spillage.
· Clean up all spills immediately.
· Avoid breathing vapors and contact with skin and eyes.
MAJOR SPILLS
■ Environmental hazard - contain spillage.
Moderate hazard.
· 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.
Decomposition products formed on prolonged heating or use include highly flammable and carcinogenic benzene and corrosive phenol. Phenol may collect in tank vent pipes and protective gear must be used when vents are cleaned.

RECOMMENDED STORAGE METHODS

· Metal can or drum
· Packing as recommended by manufacturer.

STORAGE REQUIREMENTS

· Store in original containers.

· Keep containers securely sealed.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
US - Oregon Permissible Exposure Limits (Z-1)	biphenyl mixture with phenyl ether (Phenyl ether - diphenyl mixture (vapor))	1	7						
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	biphenyl mixture with phenyl ether (Phenyl ether-biphenyl mixture, vapor)	1	7						
US NIOSH Recommended Exposure Limits (RELs)	biphenyl mixture with phenyl ether (Phenyl ether-biphenyl mixture (vapor))	1	7						
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	biphenyl mixture with phenyl ether (Phenyl ether-Diphenyl mixture (vapour))	1	7	2	14				
US - Hawaii Air Contaminant Limits	biphenyl mixture with phenyl ether (Phenyl ether-biphenyl mixture, vapor)	1	7						
US - Michigan Exposure Limits for Air Contaminants	biphenyl mixture with phenyl ether (Phenyl ether-biphenyl mixture, vapor)	1	7						
Canada - Alberta Occupational Exposure Limits	phenyl ether (Diphenyl ether, vapour (Phenyl ether))	1	7	2	14				
Canada - British Columbia Occupational Exposure Limits	phenyl ether (Phenyl ether - Vapour (Diphenyl ether))	1		2					
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	phenyl ether (Phenyl ether, vapour)	1	7	2	14				
US OSHA Permissible Exposure Levels (PELs) - Table Z1	phenyl ether (Phenyl ether, vapor)	1	7						
US ACGIH Threshold Limit Values (TLV)	phenyl ether (Phenyl ether)	1		2					Value is for the vapor of phenyl ether. TLV Basis: upper respiratory tract & eye irritation;

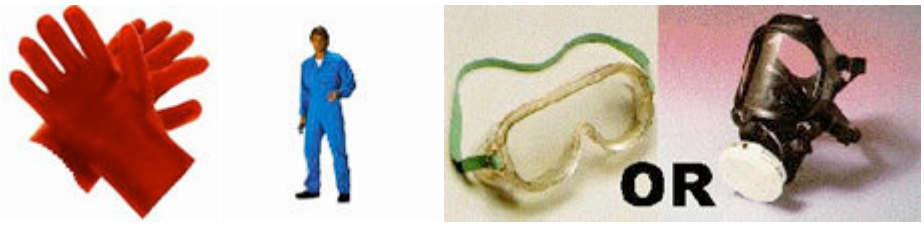
						nausea
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	phenyl ether (Phenyl ether, vapor)	1	7			
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	phenyl ether (Phenyl ether, vapor)	1	7			
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	phenyl ether (Phenyl ether, vapor)	1	7			
US - Minnesota Permissible Exposure Limits (PELs)	phenyl ether (Phenyl ether, vapor)	1	7			
US - California Permissible Exposure Limits for Chemical Contaminants	phenyl ether (Phenyl ether, vapor)	1	7			
US - Idaho - Limits for Air Contaminants	phenyl ether (Phenyl ether (vapor))	1	7			
US - Hawaii Air Contaminant Limits	phenyl ether (Phenyl ether, vapor)	1	7	2	14	
US - Alaska Limits for Air Contaminants	phenyl ether (Phenyl ether, Vapor)	1	1			
US - Alaska Limits for Air Contaminants	phenyl ether (Phenyl ether, Vapor)	1	7			
US - Washington Permissible exposure limits of air contaminants	phenyl ether (Phenyl ether (vapor))	1		3		
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	phenyl ether (Phenyl ether (vapour))	1		2		
Canada - Nova Scotia Occupational Exposure Limits	phenyl ether (Phenyl ether)	1		2		Value is for the vapor of phenyl ether. TLV Basis: upper respiratory tract & eye irritation; nausea
Canada - Prince Edward Island Occupational Exposure Limits	phenyl ether (Phenyl ether)	1		2		Value is for the vapor of phenyl ether. TLV Basis: upper respiratory tract & eye

								irritation; nausea
Canada - Northwest Territories Occupational Exposure Limits (English)	phenyl ether (Phenyl ether (vapor))	1	7	2	14			
US NIOSH Recommended Exposure Limits (RELs)	biphenyl (Diphenyl)	0.2	1					
Canada - Alberta Occupational Exposure Limits	biphenyl (Biphenyl (Diphenyl))	0.2	1.3					
Canada - British Columbia Occupational Exposure Limits	biphenyl (Biphenyl)	0.2						
US ACGIH Threshold Limit Values (TLV)	biphenyl (Biphenyl)	0.2						TLV Basis: pulmonary function
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	biphenyl (Diphenyl (Biphenyl))	0.2	1					
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	biphenyl (Biphenyl)	0.2	1.3					
US OSHA Permissible Exposure Levels (PELs) - Table Z1	biphenyl (Diphenyl (Biphenyl))	0.2	1					
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	biphenyl (Diphenyl (Biphenyl))	0.2	1					
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	biphenyl (Diphenyl (Biphenyl))	0.2	1					
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	biphenyl (Diphenyl (Biphenyl))	0.2	1					
US - Idaho - Limits for Air Contaminants	biphenyl (Diphenyl (Biphenyl))	0.2	1					
US - Minnesota Permissible Exposure Limits (PELs)	biphenyl (Diphenyl (Biphenyl))	0.2	1					
US - California Permissible Exposure Limits for Chemical	biphenyl (Biphenyl; diphenyl; phenylbenzene)	0.2	1.5					

Contaminants						
US - Hawaii Air Contaminant Limits	biphenyl (Diphenyl (Biphenyl))	0.2	1.5	0.6	4	
US - Alaska Limits for Air Contaminants	biphenyl (Biphenyl; see Diphenyl - Total dust)	15				
US - Alaska Limits for Air Contaminants	biphenyl (Biphenyl; see Diphenyl - Respirable fraction)	5				
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	biphenyl (Biphenyl (diphenyl))	0.2		0.6		
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	biphenyl (Biphenyl)	0.2	1	0.2	1	
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	biphenyl (Diphenyl, see Biphenyl)	0.2	1	0.6	3	
US - Washington Permissible exposure limits of air contaminants	biphenyl (Biphenyl (Diphenyl))	0.2		0.6		
Canada - Northwest Territories Occupational Exposure Limits (English)	biphenyl (Biphenyl)	0.2	1.3	0.6	3.8	
Canada - Nova Scotia Occupational Exposure Limits	biphenyl (Biphenyl)	0.2				TLV Basis: pulmonary function
Canada - Prince Edward Island Occupational Exposure Limits	biphenyl (Biphenyl)	0.2				TLV Basis: pulmonary function
US - Oregon Permissible Exposure Limits (Z-1)	biphenyl (Diphenyl (Biphenyl))	0.2	1			
US - Alaska Limits for Air Contaminants	biphenyl (Diphenyl (Biphenyl))	0.2	1			
US - Michigan Exposure Limits for Air Contaminants	biphenyl (Diphenyl (Biphenyl))	0.2	1			

ENDOELTABLE

PERSONAL PROTECTION



RESPIRATOR
Type A-P 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.
· P.V.C. apron.
· Barrier cream.
· Skin cleansing cream.
· Eye wash unit.

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.

State	Liquid	Molecular Weight	324.44
Melting Range (°F)	54	Viscosity	Not Available
Boiling Range (°F)	495	Solubility in water (g/L)	Immiscible
Flash Point (°F)	241	pH (1% solution)	Not applicable.
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	1150	Vapor Pressure (mmHg)	0.075 @ 25C
Upper Explosive Limit (%)	6.2 @ 260 C	Specific Gravity (water=1)	1.06 @ 25 C
Lower Explosive Limit (%)	0.5 @ 260 C	Relative Vapor Density (air=1)	5.7
Volatile Component (%vol)	Not available.	Evaporation Rate	Not available

APPEARANCE
Pale coloured liquid with a geranium-like odour. Colour darkens on use. Immiscible with water, miscible with most organic solvents. Threshold of odour detection 0.1 to 1.0 ppm.

log Kow 4.2 log Kow 3.16-4.09

Material	Value

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

· Presence of incompatible materials.
· Product is considered stable.

STORAGE INCOMPATIBILITY

■ Avoid reaction with oxidizing agents.

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

Section 11 - TOXICOLOGICAL INFORMATION

biphenyl mixture with phenyl ether

TOXICITY AND IRRITATION

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.
BIPHENYL:
BIPHENYL MIXTURE WITH PHENYL ETHER:
■ The material may be irritating to the eye, with prolonged contact causing 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.
PHENYL ETHER:
BIPHENYL MIXTURE WITH PHENYL ETHER:
■ 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.
BIPHENYL MIXTURE WITH PHENYL ETHER:

TOXICITY	IRRITATION
biphenyl (mixed with phenyl ether) 3: 7	Skin (rabbit): 500 mg/24h - Mild
	Eye (rabbit): 500 mg/24h - Mild

TOXICITY	IRRITATION
PHENYL ETHER:	
Oral (rat) LD50: 3370 mg/kg	Eye (rabbit): 10 ppm/140h
Dermal (rabbit) LD50: 5000 mg/kg	Skin (rabbit): 500 mg/24h - Mild
Oral (Rat) LD50: 4000 mg/kg	[DOW]
Dermal (Rabbit) LD50: 7940 mg/kg *	

■ For phenyl ether:

In rats, radiolabeled phenyl ether (10 mg/kg, intragastrically) is extensively metabolised and most radioactivity (>80% of the dose) is excreted in the urine as conjugated mono-hydroxy and dihydroxy derivatives, including two that also have a 4-methoxy group. Unidentified reactive intermediates of these metabolites, however, were thought to be responsible for irreversible binding of radioactivity to proteins in liver, kidney and lung tissues.

A 6-hour topical administration of radiolabeled phenyl ether (diluted in a diethyl phthalate vehicle) to rats in amounts of 10, 100 and 1000 mg/kg body weight resulted in systemic absorption of 19-23% of the radioactivity applied, most of which was excreted in the urine.

The inhalational NOAEL in rats exposed to diphenyl ether 7 hours/day, 5 days/week, for a total of 20 exposures, was reported to be 4.9 ppm. A concentration of 10 ppm caused mild eye and nasal irritation.

Mutagenicity: Phenyl ether has been extensively tested in the standard Ames assay for point mutations	and elicited no mutagenic response in any of the S. Typhimurium tester strains employed, either with or without inclusion of metabolic activation.
Developmental Toxicity	A Developmental Toxicity study of phenyl ether has been conducted with rats using oral gavage . Maternal toxicity was noted at the two higher dose levels of 500 and 200 mg/kg/day, and included decreases in Body Weight gain and Food

Consumption, excessive salivation, alopecia and staining of the hair coat in the ano-genital region; deaths of 2 high dose rats were considered related to the treatment. No effects observed on foetal resorptions, foetal viability, postimplantation loss or total implantations. Mean litter weights in treated and control groups were similar. No significant increases were observed in incidence of foetal malformations or variations at any treatment level. The NOAEL for maternal toxicity was >/= 50 mg/kg/d and the NOAEL for teratogenicity was >/= 500 mg/kg/d, the highest dosage tested.

ScienceLab MSDS

BIPHENYL:

Oral (rat) LD50: 2400 mg/kg

Eye (rabbit): 100 mg - Mild

Subcutaneous (rat) LD50: 3150 mg/kg

Dermal (rabbit) LD50: >5010 mg/kg

■ for biphenyl:

Biphenyl is well absorbed through the gastrointestinal tract and presumably also via lung and skin. In those species examined, the metabolites of biphenyl, mainly 4-hydroxybiphenyl, are excreted rapidly and almost exclusively in the urine. The acute oral toxicity of biphenyl is moderate. It is non-irritating to skin and only slightly irritating to the eyes. There is no evidence of dermal sensitization. Subchronic exposure by inhalation caused bronchopulmonary changes

In toxicological studies in which rodents have been administered diets containing biphenyl for various periods of time, effects on the urinary system have often been reported. A marked increase in the incidence of morphological (i.e. formation of calculi) and/or histopathological (e.g. hyperplasia, desquamation) effects has been observed within the urinary tract of male rats administered diets containing more than 2500 mg biphenyl/kg for periods ranging from 32 to 104 weeks. An increase in the occurrence of calculi within the urinary bladder has also been observed in female rats, but at a lower incidence than in males. Similarly, in a long-term dietary study, increased squamous metaplasia within the urinary transitional epithelium was also observed in female rats; again, however, the incidence was lower than that observed in males. In male mice, only 1 of 10 animals given a diet containing 10 000 mg biphenyl/kg (1500 mg/kg body weight per day) for 32 weeks developed simple hyperplasia and papillary or nodular dysplasia of the urinary bladder . Effects on blood chemistry and haematological parameters have also been observed in animals administered biphenyl orally; these effects occurred in male and female rats and mice at intakes lower than those associated with the development of effects in the urinary bladder of male rats administered biphenyl.. For non-neoplastic effects, the LOEL was 38 mg/kg body weight per day based upon the development of alterations in haematological parameters (i.e. decreased haemoglobin concentration and haematocrit) in rats fed diets containing 0, 500, 1500, or 4500 mg biphenyl/kg (reported intakes of 0, 38, 113, or 338 mg/kg body weight per day) for 2 years .

Available information indicates that biphenyl has no reproductive or developmental effects at doses lower than those associated with the development of adverse effects in the parental generation.

An increased incidence of benign and malignant tumours within the urinary bladder was observed in male F344/DuCrj rats administered diets containing high levels (i.e. not less than 4500 mg/kg) of biphenyl for 2 years. Tumour incidence was not increased in female rats or in male or female Crj:BDF1 mice. In female mice, there were slight increases in the incidences of benign and malignant liver tumours in animals receiving biphenyl in the diet; however, the results were not dose dependent over the entire range of concentrations tested. In other studies, biphenyl exhibited tumour-promoting activity with respect to the development of bladder neoplasms in male rats but not in male mice

In vitro studies with bacteria have provided no evidence of mutagenic potential for biphenyl; with Saccharomyces cerevisiae D7, gene mutation and mitotic recombination were observed with or without metabolic activation. However, genetic toxicology testing in mammalian cells has produced positive results in the presence of metabolic activation and negative results in the absence of metabolic activation.

Neoplastic by RTECS criteria.

CARCINOGEN

	US - Rhode Island Hazardous Substance List	IARC	

SKIN

biphenyl	Canada - Alberta Occupational Exposure Limits - Skin	Substance Interaction	1

Section 12 - ECOLOGICAL INFORMATION

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

This material and its container must be disposed of as hazardous waste.
Avoid release to the environment.
Refer to special instructions/ safety data sheets.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
phenyl ether	HIGH		LOW	MED
biphenyl	LOW	MED	MED	MED

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.
¦ 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 or consult manufacturer for recycling options.
· Consult Waste Management Authority for disposal.

Section 14 - TRANSPORTATION INFORMATION

DOT:
Symbols: G Hazard class or Division: 9
Identification Numbers: UN3082 PG: III
Label Codes: 9 Special provisions: 8, 146,
335, IB3,
T4, TP1,
TP29
Packaging: Exceptions: 155 Packaging: Non- bulk: 203
Packaging: Exceptions: 155 Quantity limitations: No limit
Passenger aircraft/rail:
Quantity Limitations: Cargo No limit Vessel stowage: Location: A
aircraft only:
Vessel stowage: Other: None
Hazardous materials descriptions and proper shipping names:
Environmentally hazardous substance, liquid, n.o.s

Air Transport IATA:

ICAO/IATA Class: 9 ICAO/IATA Subrisk: None
UN/ID Number: 3082 Packing Group: III
Special provisions: A97
Cargo Only
Packing Instructions: 450 L Maximum Qty/Pack: 450 L
Passenger and Cargo Passenger and Cargo
Packing Instructions: 964 Maximum Qty/Pack: 964
Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity
Packing Instructions: 30 kg G Maximum Qty/Pack: Y964
Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID,
N.O.S. *(CONTAINS BIPHENYL)

Maritime Transport IMDG:

IMDG Class: 9 IMDG Subrisk: None
UN Number: 3082 Packing Group: III
EMS Number: F-A , S-F Special provisions: 179 274 335 909
Limited Quantities: 5 L Marine Pollutant: Yes
Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.

(contains biphenyl)

Section 15 - REGULATORY INFORMATION

biphenyl mixture with phenyl ether (CAS: 8004-13-5) is found on the following regulatory lists;
"Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","US - Hawaii Air Contaminant Limits","US - Michigan Exposure Limits for Air Contaminants","US - Oregon Permissible Exposure Limits (Z-1)","US - Pennsylvania - Hazardous Substance List","US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants","US DOT Coast Guard Bulk Hazardous Materials - List of Flammable and Combustible Bulk Liquid Cargoes","US NIOSH Recommended Exposure Limits (RELs)"

Regulations for ingredients

phenyl ether (CAS: 101-84-8) 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 - 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 Council of Chemical Associations (ICCA) - High Production Volume List","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 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 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 DOE Temporary Emergency Exposure Limits (TEELs)","US DOT Coast Guard Bulk Hazardous Materials - List of Flammable and Combustible Bulk Liquid Cargoes","US EPA High Production Volume Program Chemical List","US Food Additive Database","US NIOSH Recommended Exposure Limits (RELs)","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US Toxic Substances Control Act (TSCA) - Inventory","US TSCA Section 8 (d) - Health and Safety Data Reporting"

biphenyl (CAS: 92-52-4) 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 - 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 National Pollutant Release Inventory (NPRI)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","IMO IBC Code Chapter 17: Summary of minimum requirements","International Council of Chemical Associations (ICCA) - High Production Volume List","International Fragrance Association (IFRA) Survey: Transparency List","OECD Representative List of High Production Volume (HPV) Chemicals","US - Alaska Limits for Air Contaminants","US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified","US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List","US - California Permissible Exposure Limits for Chemical Contaminants","US - California Toxic Air Contaminant List Category IV","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 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 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 CAA (Clean Air Act) - HON Rule - Organic HAPs (Hazardous Air Pollutants)","US Clean Air Act - Hazardous Air Pollutants","US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides","US Department of Transportation (DOT) Marine Pollutants - Appendix B","US DOE Temporary Emergency Exposure Limits (TEELs)","US DOT Coast Guard Bulk Hazardous Materials - List of Flammable and Combustible Bulk Liquid Cargoes","US EPA Acute Exposure Guideline Levels (AEGLs) - Interim","US EPA Carcinogens Listing","US EPA High Production Volume Program Chemical List","US EPA Master Testing List - Index I Chemicals Listed","US EPCRA Section 313 Chemical List","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 NFPA 499 Combustible Dusts","US NIOSH Recommended Exposure Limits (RELs)","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US Toxic Substances Control Act (TSCA) - Inventory","US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements","US TSCA Section 4/12 (b) - Sunset Date/Status","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

ND
Substance CAS Suggested codes phenyl ether 101- 84- 8 N; R50/53

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■ 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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