Hydrazine

sc-280790

Material Safety Data Sheet

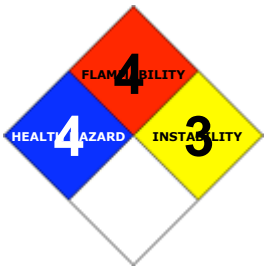
Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
Hydrazine

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
H4-N2, H2-N-N-H2, "anhydrous hydrazine", diamide, diamine, "hydrazine base", Levoxine, Oxytreat

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability:	4		
Toxicity:	4		
Body Contact:	4		
Reactivity:	2		
Chronic:	3		

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

CANADIAN WHMIS SYMBOLS

EMERGENCY OVERVIEW

RISK

Heating may cause an explosion.
Causes burns.
Risk of serious damage to eyes.
May cause CANCER.
May cause SENSITISATION by skin contact.
Toxic by inhalation, in contact with skin and if swallowed.
Flammable.
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.
■ 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.
■ Ingestion of alkaline corrosives may produce burns around the mouth, ulcerations and swellings of the mucous membranes, profuse saliva production, with an inability to speak or swallow.
Both the esophagus and stomach may experience burning pain; vomiting and diarrhea may follow.
■ Hydrazine derivatives tend to be local irritants and cause convulsions, liver damage, and destruction of red blood cells.
They also damage the kidneys, and cause stimulation of the central nervous system with tremors and convulsions, progressing to depression, respiratory collapse and death.

EYE

■ The material can produce chemical burns to the eye following direct contact. Vapors or mists may be extremely irritating.
■ If applied to the eyes, this material causes severe eye damage.
■ Direct eye contact with corrosive bases can cause pain and burns.
There may be swelling, epithelium destruction, clouding of the cornea and inflammation of the iris.
■ The vapour when concentrated has pronounced eye irritation effects and this gives some warning of high vapour concentrations.
If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area.

SKIN

■ The material can produce chemical burns following direct contactwith the skin.
■ Skin contact with the material may produce toxic effects; systemic effectsmay result following absorption.
■ The material can produce severe chemical burns following direct contactwith the skin.
■ The material is a vesicant causing blistering on contact.
■ Skin contact with alkaline corrosives may produce severe pain and burns; brownish stains may develop.
The corroded area may be soft, gelatinous and necrotic; tissue destruction may be deep.
■ Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later.
■ 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.

INHALED

■ Inhalation of vapors or aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects.
■ The material can cause respiratory irritation in some persons.
The body's response to such irritation can cause further lung damage.
■ Inhaling corrosive bases may irritate the respiratory tract.
Symptoms include cough, choking, pain and damage to the mucous membrane.
■ Inhalation hazard is increased at higher temperatures.
■ Symptoms of inhalation of hydrazine (and some of its derivatives), may include nausea and headache.
Central nervous system (CNS) excitability may lead to convulsions and, in severe cases, respiratory arrest and death.
■ If exposure to highly concentrated vapor atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and unless resuscitated - death.

CHRONIC HEALTH EFFECTS

■ Repeated or prolonged exposure to corrosives may result in the erosion of teeth, inflammatory and ulcerative changes in the mouth and necrosis (rarely) of the jaw. Bronchial irritation, with cough, and frequent attacks of bronchial pneumonia may ensue.
Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.
Skin contact with the material is more likely to cause a sensitization reaction in some persons compared to the general population.
There is ample evidence that this material can be regarded as being able to cause cancer in humans based on experiments and other information.
Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.
There is some evidence that inhaling this product is more likely to cause a sensitization reaction in some persons compared to the general population.
There is some evidence that human exposure to the material may result in developmental toxicity. This evidence is based on animal studies where effects have been observed in the absence of marked maternal toxicity, or at around the same dose levels as other toxic effects but which are not secondary non-specific consequences of the other toxic effects.
When administered orally, hydrazine induced pulmonary adenomas and adenocarcinomas in mice. Inhalation induced lung carcinomas and lymphosarcomas of the spleen in female mice. A study of 423 men, involved in the manufacture of hydrazine revealed three stomach, one prostate and a neurogenic cancer.
Hydrazine (and some of its derivatives), is a strong convulsant in laboratory animals and can cause central nervous system (CNS) depression or stimulation. Symptoms of CNS depression may include nonspecific discomfort, 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. CNS stimulation may produce dyspnea, coughing, bronchospasm, and laryngospasm. Muscular involvement may produce symptoms ranging from fasciculation to spasticity or seizures. Headache, dizziness and confusion may also result as can hyperpyrexia or a sensation of warmth. Other symptoms may include nausea, vomiting, diarrhoea and difficulty in urination. Cardiovascular involvement may produce alterations in blood pressure or arrhythmia.
Pulmonary oedema and cardiovascular collapse also seem to be a feature of acute hydrazine poisonings. Animals that survive for more than a day frequently develop liver necrosis and renal failure. As judged by a few severe poisonings, man reacts like monkey in the sense that liver injury is more severe than kidney failure. Severe hypoglycaemia may develop even earlier than liver necrosis although this is rarely mentioned in the literature.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
hydrazine	302-01-2	>99

Section 4 - FIRST AID MEASURES

SWALLOWED
· For advice, contact a Poisons Information Center or a doctor at once. · Urgent hospital treatment is likely to be needed.

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 or hair contact occurs: · Immediately flush body and clothes with large amounts of water, using safety shower if available. · Quickly remove all contaminated clothing, including footwear.

INHALED
· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested. Inhalation of vapors or aerosols (mists, fumes) may cause lung edema. Corrosive substances may cause lung damage (e.g.

NOTES TO PHYSICIAN
■ For acute or short-term repeated exposures to highly alkaline materials:
· Respiratory stress is uncommon but present occasionally because of soft tissue edema.
· Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
In poisonings involving hydrazine:
Correction of early hypoglycaemia, with large parenteral doses of pyridoxine appears to suppress convulsions and other neurological effects. In man, hydrazine-induced hyperexcitability and coma may respond to massive doses of pyridoxine but there is no evidence that liver necrosis or damage can be prevented or corrected by this antidote.
GOSSELIN, SMITH & HODGE: Clinical Toxicology of Commercial Products, 5 th Ed.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	104.034 @ 20C
Upper Explosive Limit (%):	100
Specific Gravity (water=1):	1.004 @ 25C
Lower Explosive Limit (%):	4.7

EXTINGUISHING MEDIA
· Water spray or fog.
· Foam.
Prevent of reignition may require to use flooding quantities of water.

FIRE FIGHTING
· Alert Emergency Responders and tell them location and nature of hazard.
· May be violently or explosively reactive.
When any large container (including road and rail tankers) is involved in a fire,
consider evacuation by 1000 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 dioxide (CO_2), carbon monoxide (CO), nitrogen oxides (NO_x), other pyrolysis products typical of burning organic material.
Contains low boiling substance: Closed containers may rupture due to pressure buildup under fire conditions.
May emit corrosive fumes.
· Hot organic vapors or mist are capable of sudden spontaneous combustion when mixed with air even at temperatures below their published autoignition temperatures.
· The temperature of ignition decreases with increasing vapor volume and vapor/air contact times and is influenced by pressure change.
Hydrazine vapour once ignited will continue to burn in absence of air.

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.
Full face- shield.
Gloves:
1.BUTYL 2.NATURAL+NEOPRENE
Respirator:
Type AK-P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
· Remove all ignition sources.
· Clean up all spills immediately.
· Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material.
· Check regularly for spills and leaks.
MAJOR SPILLS
· DO NOT touch the spill material.
· 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

■ Contains low boiling substance:
Storage in sealed containers may result in pressure buildup causing violent rupture of containers not rated appropriately.
· Check for bulging containers.
· Vent periodically.
· 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.
Avoid contact with incompatible materials (including air).

RECOMMENDED STORAGE METHODS

■ Glass container.
· 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.

STORAGE REQUIREMENTS

· Store in approved flammable liquid storage area.
· No smoking, naked lights/ignition sources.
· Keep containers securely sealed.
· Store away from incompatible materials in a cool, dry, well-ventilated area.
· Protect containers against physical damage and check regularly for leaks.
· 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 in grounded, properly designed and approved vessels and away from incompatible materials
· 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
· 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
· Observe manufacturer's storing and handling recommendations.
DO NOT store near acids, or oxidizing agents.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA	STEL ppm	STEL	Peak ppm	Peak	TWA F/CC	Notes

			mg/m³		mg/m³		mg/m³		
Canada - Alberta Occupational Exposure Limits	hydrazine (Hydrazine)	0.01	0.01						
Canada - British Columbia Occupational Exposure Limits	hydrazine (Hydrazine)	0.01							Skin; 2B
US - Minnesota Permissible Exposure Limits (PELs)	hydrazine (Hydrazine)	0.1	0.1						
US NIOSH Recommended Exposure Limits (RELs)	hydrazine (Hydrazine)					0.03	0.04		See Appendix A; Ca; (Ceiling ([2-hour]))
US OSHA Permissible Exposure Levels (PELs) - Table Z1	hydrazine (Hydrazine)	1	1.3						
US ACGIH Threshold Limit Values (TLV)	hydrazine (Hydrazine)	0.01							TLV Basis: upper respiratory tract cancer
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	hydrazine (Hydrazine)	0.2	0.1						
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	hydrazine (Hydrazine)	1	1.3						
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	hydrazine (Hydrazine)	0.1	0.1						
US - Idaho - Limits for Air Contaminants	hydrazine (Hydrazine)	1	1.3						
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	hydrazine (HYDRAZINE)	0.004							
US - California Permissible Exposure Limits for Chemical Contaminants	hydrazine (Hydrazine)	0.01	0.013						
US - Hawaii Air Contaminant Limits	hydrazine (Hydrazine)	0.1	0.1						
US - Alaska Limits for Air Contaminants	hydrazine (Hydrazine)	0.1	0.1						

Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	hydrazine (Hydrazine)	0.01		0.03			Skin, T20
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	hydrazine (K-Hydrazine - Skin)		(See Table 16)				
Canada - Yukon Carcinogens with a Permitted Exposure	hydrazine (Hydrazine)	0.1	0.1				
US - Washington Permissible exposure limits of air contaminants	hydrazine (Hydrazine)	0.1		0.3			
Canada - Prince Edward Island Occupational Exposure Limits	hydrazine (Hydrazine)	0.01					TLV Basis: upper respiratory tract cancer
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	hydrazine (Hydrazine)	1	1.3				
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	hydrazine (Hydrazine)	0.1	0.13				
Canada - Nova Scotia Occupational Exposure Limits	hydrazine (Hydrazine)	0.01					TLV Basis: upper respiratory tract cancer
US - Michigan Exposure Limits for Air Contaminants	hydrazine (Hydrazine)	0.1	0.1				
US - Oregon Permissible Exposure Limits (Z-1)	hydrazine (Hydrazine)	1	1.3				
Canada - Northwest Territories Occupational Exposure Limits (English)	hydrazine (Hydrazine - Skin)	0.1	0.13	0.3	0.39		

ENDOELTABLE

PERSONAL PROTECTION




RESPIRATOR

• type ak-p filter of sufficient capacity.

Consult your EHS staff for recommendations

EYE

· Chemical goggles.
· Full face shield.

HANDS/FEET

■ Elbow length PVC gloves.
· When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.
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.
· Neoprene rubber gloves.

OTHER

· Employees working with confirmed human carcinogens should be provided with, and be required to wear, clean, full body protective clothing (smocks, coveralls, or long-sleeved shirt and pants), shoe covers and gloves prior to entering the regulated area.
· Employees engaged in handling operations involving carcinogens should be provided with, and required to wear and use half-face filter-type respirators with filters for dusts, mists and fumes, or air purifying canisters or cartridges. A respirator affording higher levels of protection may be substituted.
· Emergency deluge showers and eyewash fountains, supplied with potable water, should be located near, within sight of, and on the same level with locations where direct exposure is likely.
· Prior to each exit from an area containing confirmed human carcinogens, employees should be required to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day, to place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. The contents of such impervious containers must be identified with suitable labels. For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood.
· Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.
· Overalls.
· PVC Apron.
· 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

· Employees exposed to confirmed human carcinogens should be authorized to do so by the employer, and work in a regulated area.
· Work should be undertaken in an isolated system such as a "glove-box" . Employees should wash their hands and arms upon completion of the assigned task and before engaging in other activities not associated with the isolated system.
· Within regulated areas, the carcinogen should be stored in sealed containers, or enclosed in a closed system, including piping systems, with any sample ports or openings closed while the carcinogens are contained within.
· Open-vessel systems are prohibited.
· Each operation should be provided with continuous local exhaust ventilation so that air movement is always from ordinary work areas to the operation.
· Exhaust air should not be discharged to regulated areas, non-regulated areas or the external environment unless decontaminated. Clean make-up air should be introduced in sufficient volume to maintain correct operation of the local exhaust system.
· For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood. Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.
· Except for outdoor systems, regulated areas should be maintained under negative pressure (with respect to non-regulated areas).
· Local exhaust ventilation requires make-up air be supplied in equal volumes to replaced air.
· Laboratory hoods must be designed and maintained so as to draw air inward at an average linear face velocity of 150 feet/ min. with a minimum of 125 feet/ min. Design and construction of the fume hood requires that insertion of any portion of the employees body, other than hands and arms, be disallowed.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.
Mixes with water.
Corrosive.
Alkaline.

Toxic or noxious vapours/gas.

State	Liquid	Molecular Weight	32.05
Melting Range (°F)	36	Viscosity	Not Available
Boiling Range (°F)	236	Solubility in water (g/L)	Miscible
Flash Point (°F)	100	pH (1% solution)	10.7
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	73- 518	Vapor Pressure (mmHg)	104.034 @ 20C
Upper Explosive Limit (%)	100	Specific Gravity (water=1)	1.004 @ 25C
Lower Explosive Limit (%)	4.7	Relative Vapor Density (air=1)	1.1
Volatile Component (%vol)	100	Evaporation Rate	Not available

APPEARANCE

Fuming oily liquid or white crystals; soluble in water. Distinct ammoniacal or fishy odour. Insoluble in alcohol and ether. Odour threshold is higher than TLV and hence has no warning property.

log Kow -3.08- -0.6

Material	Value

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

· Presence of incompatible materials.
· Product is considered stable.
Avoid contact with air.
Product is considered stable when stored in closed containers under inert gas atmosphere at normal room temperatures in the absence of UV radiation. Hazardous polymerisation will not occur under correct storage and handling procedures.

STORAGE INCOMPATIBILITY

■ Hydrazine:
· is a highly reactive reducing agent and strong base
· does not need air or oxygen for decomposition; can ignite spontaneously, in air, at room temperature or when absorbed on porous materials, asbestos, cloth, cork, earth, wood
· reacts violently (may explode on contact) with oxidisers, acids, halogens, iodine pentoxide, some metals (carbon steel, copper, zinc) some metal oxides (iron, copper, molybdenum), metal catalysts, silver compounds, titanium compounds, 1-chloro-2,4-dinitrobenzenes, chromium dioxide, 3-(3-cyano-1,2,4-oxadiazol-5-yl)-4-cyanofurazan-2(5-)oxide, dicyanofurazan, diethylzinc, potassium, potassium dichromate, sodium hydroxide, thiocarbonyl azide thiocyanate, sodium dichromate dihydrate
· forms heat-, friction, and shock- sensitive explosive mixtures with many compounds, including 2-chloro-5-methylnitrobenzene, lithium perchlorate, metal salts, sodium perchlorate, 1,3,5-trifluorotrinitrobenzene
· is incompatible with aluminium, copper, lead, manganese, nickel, silver, titanium, zinc and their alloys, organic anhydrides, aldehydes, alcohols, alkali metals, alkylene oxides, ammonia, caprolactam solution, cresols, chromates, epichlorohydrin, glycols, phenols, perchlorates, potassium peroxodisulfate, ruthenium(III) chloride, tetryl, zinc diamide
· attacks some plastics, rubbers and coatings.
· Incidents involving interaction of active oxidants and reducing agents, either by design or accident, are usually very energetic and examples of so-called redox reactions.
· Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.
Avoid strong acids.
· Avoid contact with copper, aluminium and their alloys.

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

Section 11 - TOXICOLOGICAL INFORMATION

hydrazine

TOXICITY AND IRRITATION

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

TOXICITY	IRRITATION
Oral (rat) LD50: 60 mg/kg	Skin (human): Corrosive
Inhalation (rat) LC50: 570 ppm/4h	Eye (human): Corrosive
Dermal (rabbit) LD50: 91 mg/kg	

■ Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's edema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type.
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 produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
The material may produce respiratory tract irritation, and result in damage to the lung including reduced lung function.
The material may cause severe 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. Repeated exposures may produce severe ulceration.
WARNING: This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans.
Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogen
[National Toxicology Program: U.S. Dep. of Health & Human Services 2002].

CARCINOGEN

Hydrazine	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	2B
Hydrazine/Hydrazine sulfate	US EPA Carcinogens Listing	Carcinogenicity	B2
Hydrazine/Hydrazine sulfate	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	B2
Hydrazine	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A3
hydrazine	US - Rhode Island Hazardous Substance List	IARC	C
HYDRAZINE	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65
HYDRAZINE	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65
Hydrazine (inhalation)	US Air Toxics Hot Spots TSD for Describing Available Cancer Potency Factors	IARC Class	2B
Hydrazine (oral)	US Air Toxics Hot Spots TSD for Describing Available Cancer Potency Factors	IARC Class	
Hydrazine	US NIOSH Recommended Exposure Limits (RELs) - Carcinogens	Carcinogen	Ca
hydrazine	US - Maine Chemicals of High Concern List	Carcinogen	B2
TWAPPM~	US - Maine Chemicals of High Concern List	Carcinogen	A3
VPVB_(VERY~	US - Maine Chemicals of High Concern List	Carcinogen	CA Prop 65; IRIS; NTP 11th ROC
VPVB_(VERY~	US - Maine Chemicals of High Concern List	Carcinogen	IARC

SKIN

hydrazine	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants - Skin	Skin Designation	X
hydrazine	US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants - Skin	Skin Designation	X
hydrazine	US - Washington Permissible exposure limits of air contaminants - Skin	Skin	X
hydrazine	US ACGIH Threshold Limit Values (TLV) - Skin	Skin Designation	Yes
hydrazine	US AIHA Workplace Environmental Exposure Levels (WEELs) - Skin	Notes	TLV Basis: upper respiratory tract cancer
hydrazine	US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs) - Skin	Skin	X

hydrazine	US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs) - Skin	Skin	X
hydrazine	US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants - Skin	Skin Designation	X
hydrazine	Canada - British Columbia Occupational Exposure Limits - Skin	Notation	Skin; 2B
hydrazine	US - Minnesota Permissible Exposure Limits (PELs) - Skin	Skin Designation	X
hydrazine	US - Hawaii Air Contaminant Limits - Skin Designation	Skin Designation	X
hydrazine	US OSHA Permissible Exposure Levels (PELs) - Skin	Skin Designation	X
hydrazine	US - Oregon Permissible Exposure Limits (Z2) - Skin	Skin	X
hydrazine	US - California Permissible Exposure Limits for Chemical Contaminants - Skin	Skin	X
hydrazine	US - California Permissible Exposure Limits for Chemical Contaminants - Skin	Skin	S
hydrazine	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
hydrazine	LOW	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)
Corrosivity characteristic: use EPA hazardous waste number D002 (waste code C)
B. Component Waste Numbers
When hydrazine 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 U133 (waste code R,T).

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: 8
Identification Numbers: UN2029 PG: I
Label Codes: 8, 3, 6.1 Special provisions: A3, A6,
A7, A10,
B7, B16,
B53
Packaging: Exceptions: None Packaging: Non- bulk: 201
Packaging: Exceptions: None Quantity limitations: Forbidden
Passenger aircraft/rail:
Quantity Limitations: Cargo 2.5 L Vessel stowage: Location: D
aircraft only:
Vessel stowage: Other: 40, 52,
125.
Hazardous materials descriptions and proper shipping names:
Hydrazine, anhydrous

Air Transport IATA:

UN/ID Number: 2029 Packing Group: I
Special provisions: None
Cargo Only
Packing Instructions: 2.5 L Maximum Qty/Pack: 854
Passenger and Cargo Passenger and Cargo
Packing Instructions: Forbidden Maximum Qty/Pack: Forbidden
Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity
Packing Instructions: Forbidden Maximum Qty/Pack: Forbidden
Shipping Name: HYDRAZINE, ANHYDROUS

Maritime Transport IMDG:

IMDG Class: 8 IMDG Subrisk: 3, 6.1
UN Number: 2029 Packing Group: I
EMS Number: F-E , S-C Special provisions: None
Limited Quantities: 0 Marine Pollutant: Yes
Shipping Name: HYDRAZINE, ANHYDROUS

Section 15 - REGULATORY INFORMATION

hydrazine (CAS: 302-01-2) 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 - Saskatchewan Occupational Health and Safety Regulations - Designated Chemical Substances","Canada - Yukon Carcinogens with a Permitted Exposure","Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances","Canada ARET (Accelerated Reduction / Elimination of Toxics) Substance List","Canada Domestic Substances List (DSL)","Canada Ingredient Disclosure List (SOR/88-64)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs","International Chemical Secretariat (ChemSec) REACH SIN* List (*Substitute It Now!) 1.1","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 OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)","US - California Permissible Exposure Limits for Chemical Contaminants","US - California Proposition 65 - Carcinogens","US - California Proposition 65 - No Significant Risk Levels (NSRLs) for Carcinogens","US - California Toxic Air Contaminant List Category II","US - Connecticut Hazardous Air Pollutants","US - Hawaii Air Contaminant Limits","US - Idaho - Limits for Air Contaminants","US - Maine Chemicals of High Concern List","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 Constituents","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 Class A toxic air pollutants: Known and Probable Carcinogens","US - Washington Dangerous waste constituents list","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 ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)","US CERCLA Priority List of Hazardous Substances","US Clean Air Act - Hazardous Air Pollutants","US Department of Homeland Security Chemical Facility Anti-Terrorism Standards - Chemicals of Interest","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 Acute Exposure Guideline Levels (AEGLs) - Final","US EPA Carcinogens Listing","US EPA National Priorities List - Superfund Chemical Data Matrix (SCDM) - Hazard Ranking System - Hazardous Substance Benchmarks","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 National Toxicology Program (NTP) 11th Report Part B. Reasonably Anticipated to be a Human Carcinogen","US NIOSH Recommended Exposure Limits (RELs)","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261","US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes","US SARA Section 302 Extremely Hazardous Substances","US Spacecraft Maximum Allowable Concentrations (SMACs) for Airborne Contaminants","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory","USA: Chemical Facility Anti-Terrorism Standards - List Appendix A - 6CFR 27"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

■ Cumulative effects may result following exposure*.
■ Possible respiratory sensitiser*.
■ May be harmful to the foetus/ embryo*.
* (limited evidence).

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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