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Safety Data Sheet

1. PRODUCT IDENTIFICATION

Name **Diethanolamine, 99%**
Synonyms N,N-diethanolamine; 2,2'-dihydroxydiethylamine; DEA
CAS# 111-42-2
EC# 203-868-0
Product Uses removal of CO₂ & H₂S from natural gas, biogas, syngas, etc; corrosion inhibitor; additive in detergent formulations, emulsifiers, defoamers and various resins

EMERGENCY INFORMATION

Canada Call CANUTEC (collect) (613) 996-6666
U.S.A. Call CHEMTREC (800) 424-9300

2. HAZARDS

GHS Class (Category)	acute oral (4)	skin irritant (2)	eye irritant (1)	STOT (3)	carcinogen (2)
Signal Words	WARNING	WARNING	DANGER	WARNING	WARNING
Hazard Statements	harmful if swallowed (H302)	causes skin irritation (H315)	causes serious eye damage (H318)	may cause liver or kidney damage (H371)	suspected of causing cancer (H351)



Canada – WHMIS
Key:

D 2A, D 2B
B 2 – Flash Point <38°C, **B 3** – Flash Point >38°C & <93°C
D 1 – Immediately Toxic, **D 2** – Chronic Toxicity
C – Oxidising Substance, **E** – Corrosive



3. COMPOSITION

	%	TWAEV / TLV ppm / mg/m ³	LD ₅₀ (mg/kg) ORAL	LD ₅₀ (mg/kg) SKIN	LC ₅₀ ppm INHALATION
Diethanolamine	>99%	0.5 / 2	680	8400	not known

4. FIRST AID

SKIN: Wash with plenty of water. Remove contaminated clothing and do not reuse until thoroughly laundered.
EYES: Wash eyes with plenty of water, holding eyelids open. Seek medical assistance promptly if there is irritation.
INHALATION: Remove from contaminated area promptly. **CAUTION: Rescuer must not endanger himself!** If breathing stops, administer artificial respiration and seek medical aid promptly.
INGESTION: Give plenty of water to dilute product. Do not induce vomiting (NOTE below). Keep victim quiet. If vomiting occurs, lower victim's head below hips to prevent inhalation of vomited material. Seek medical help promptly.

Inadvertent inhalation of vomited material may seriously damage the lungs. The danger of this is greater than the risk of poisoning through absorption of this relatively low-toxicity substance. The stomach should only be emptied under medical supervision, and after the installation of an airway to protect the lungs.

Please ensure that this MSDS is given to, and explained to people using this product.

5. FIRE FIGHTING & FLAMMABILITY

Flash Point	138°C / 280°F (closed cup)
Autoignition Temperature	662°C / 1224°F
Flammable Limits	1.6% – 9.8%
Combustion Products	carbon monoxide, nitrogen oxides, smoke, part oxidised hydrocarbon fragments including ammonia, hydrogen cyanide, nitriles, isocyanates, nitrosamines, formaldehyde
Firefighting Precautions	alcohol-resistant foam, dry chemical, water fog or spray; firefighters must wear SCBA
Static Charge Accumulation	cannot accumulate a static charge on agitation or pumping

6. ACCIDENTAL RELEASE MEASURES

Leak Precaution	dyke to control spillage and prevent environmental contamination
Handling Spill	recover free liquid with suitable pumps; absorb residue on an inert sorbent, sweep, shovel & store in closed containers for recycling or disposal

HANDLING & STORAGE

Store in stainless steel, lined steel, polypropylene or polyethylene containers (carbon steel causes discolouration) above 30°C / 86°F, away from sources of ignition, heat & substances listed in Part 10. *If product freezes, warm gently, avoiding hot spots which could cause decomposition.*

This product reacts with carbon dioxide or oxygen in the air to form hazardous products (see Part 10). Ensure that containers, empty or full, are tightly sealed unless in use. Avoid generating or breathing product mist. Use with adequate ventilation if handling hot product. If product is handled hot, wear appropriate (Part 8) insulated gloves.

Never cut, drill, weld or grind on or near this container. Avoid contact with skin & wash work clothes frequently. An eye bath and safety shower must be available near the workplace.

8. EXPOSURE CONTROL & PERSONAL PROTECTION

Ontario TWAEV	0.46ppm / 2mg/m ³	Ontario STEV	not listed
ACGIH TLV	0.46ppm / 2mg/m ³	ACGIH STEL	not listed
OSHA PEL	3.5ppm / 15mg/m ³	OSHA STEL	not listed
Ventilation	mechanical ventilation may be required to control airborne titre to regulated limits		
Hands	butyl, neoprene, nitrile or “Viton” gloves recommended – <i>other types may also protect</i>		
Eyes	safety glasses with side shields – <i>always protect the eyes</i>		
Clothing	no special protective clothing required unless material is used hot & splashing is possible		

9. PHYSICAL PROPERTIES

Odour & Appearance	clear, colourless to pale yellow liquid (<i>or white solid</i>) with mild amine (fishy) odour
Odour Threshold	~0.3ppm – variable
Vapour Pressure (<i>for 100% DEA</i>)	0.002mmHg / 0.0003kPa (25°C / 77°F)
Evaporation Rate (<i>Butyl Acetate = 1</i>)	not known – very low volatility
Vapour Density (air = 1)	3.6
Boiling Range	269°C / 516°F
Melting Point	28°C / 82°F – <i>supercools readily; freezing point hard to determine</i>
Specific Gravity	1.097 (20/20°C) – (<i>supercooled liquid</i>)
Water Solubility	954 grams per litre (20°C / 68°F)
Also soluble in	polar solvents (alcohols, acetone) low solubility in nonpolar solvents (hydrocarbons)
Log P _{o/w} (<i>octanol/water partition</i>)	-1.43
Viscosity	356centipoise (30°C / 86°F)
pH	11.5 (1 molar = ~10% solution)
Conversion Factor (<i>DEA</i>)	1ppm = 4.29mg/m ³
Molecular Weight	105g/mole (<i>DEA</i>); 18g/mole (<i>water</i>)

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10. REACTIVITY

Dangerously Reactive With Also Reactive With	strong oxidising agents; vigorous, violent reaction with strong acids & acid anhydrides nitrating substances yield explosive compounds; mercury yields shock-sensitive substances; halogens yield hydrogen halide gas; hypochlorites yield explosive chloroamines; with carbon disulphide & isocyanates, when warm, reacts with aluminum to yield hydrogen
Stability	stable; will not polymerize; may induce polymerisation of epoxides, vinyl chloride, vinyl acetate, acrylic monomers, acrolein, or acrylonitrile
Decomposes in Presence of Decomposition Products	CO ₂ in air to thermally unstable carbamates; oxidises slowly in air to hydroxylamines transient oxidation products hydroxylamines & carbamates may be unstable
Mechanical Impact Sensitivity	no

11. TOXICITY**Effects, Acute Exposure**

Skin Contact	may be irritating to skin (<i>many test reports</i>); may cause damage if contact is prolonged
Skin Absorption	yes; toxic effects may occur by this route
Eye Contact	maybe severely irritating (<i>although many tests showed DEA to be only slightly or moderately irritating</i>); may be corrosive to eyes causing permanent damage including blindness on prolonged contact
Inhalation	irritating (wheezing, coughing); low vapour pressure & viscosity makes inhalation of toxic quantities unlikely; <i>despite extensive industrial use, no diethanolamine inhalation injury has ever been reported</i>
Ingestion	may irritate mouth & throat; stomach pain, nausea, vomiting & diarrhoea may also occur – <i>not a route of industrial exposure</i>

Effects, Chronic Exposure

General	prolonged skin exposure may cause dry skin, even dermatitis; prolonged skin absorption (<i>or ingestion</i>) causes anaemia & damages liver & kidneys in rodents
Sensitising	not a sensitiser in humans or animals (<i>single case of respiratory sensitisation recorded</i>)
Carcinogen/Tumorigen	not known to be a human tumorigen or carcinogen; simultaneous exposure to nitrites & diethanolamine can cause carcinogenic nitroso compounds to form
Reproductive Effect	no known effect in humans; long-term ingestion in rats reduced sperm count
Mutagen	no known effect on humans or animals
Synergistic With	nitrites may react with DEA to create nitroso compounds – <i>some nitrosos are suspect carcinogens</i>
LD ₅₀ (oral)	680-1820, 2350, 3460 & 3540mg/kg (rat), 3300 & 4570mg/kg (mouse), 2200mg/kg (rabbit), 2000mg/kg (guinea pig),
LD ₅₀ (skin)	8400, 12,200 & 12,970mg/kg (rabbit), 13,090mg/kg (guinea pig)
LC ₅₀ (inhalation)	not known – <i>LC₅₀ is higher than the saturated vapour concentration</i>

A small excess of cancer has been discovered in people working with machining fluids containing DEA. DEA is classified A3 by ACGIH and 2B by IARC – a possible animal carcinogen.

12. ECOLOGICAL INFORMATION

Bioaccumulation	not a bioaccumulator
Biodegradation	biodegrades readily & rapidly in soil (½-life is several days) & acclimated water; 96% in 10 days & 93% in 28 days, 88% in 20 days & many others; DOW data 58% in 20 days
Abiotic Degradation	reacts with atmospheric hydroxyl radicals; estimated ½-life in air is 4 hours
Mobility in soil, water	water soluble; moves readily in soil and water
Aquatic Toxicity	
LC ₅₀ (Fish, 96hr)	589mg/litre (Cyprinodon variegatus), 1400mg/litre (Gambusia affinis), 600-1000mg/litre (Lepomis macrochirus), 1460 & 1664mg/litre (Pimephales promelas)
EC ₅₀ (Crustacea, 24hr)	2800mg/litre (Artemia salina), 170, 180 & 298mg/litre (Daphnia magna)
EC ₅₀ (Algae)	7.5 & 75mg/litre (Scenedesmus subspicatus) 2.1-2.3mg/litre (Selenastrum capricornutum) 548mg/litre (Skeletonema costatum)
EC ₅₀ (Bacteria)	>16mg/litre (Pseudomonas fluorescens & P. putida), >1000mg/litre (Pseudomonas putida)

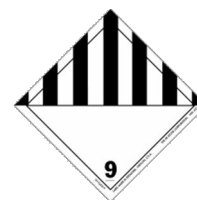
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13. DISPOSAL

Waste Disposal	do not flush to sewer , recycle if possible, local regulations may permit disposal in sanitary landfill, may be incinerated in approved facility
Containers	Drums should be reused. Recondition and pressure test by a licensed reconditioner prior to re-use. Pails must be vented and thoroughly dried prior to crushing and recycling. IBCs (intermediate bulk containers): polyethylene bottle must be pressure tested & recertified at 30 months. Replace at 60 months (5yrs). Steel containers must be inspected, pressure tested & recertified every 5 years. <i>Never cut, drill, weld or grind on or near this container, even if empty</i>

14. TRANSPORT CLASSIFICATION

Canada TDG	PIN	UN- not regulated for transport
	Shipping Name	not regulated for transport
	Class	not regulated for transport
	Packing Group	not regulated for transport
U.S.A. 49 CFR	PIN	UN – 3082*
	Shipping Name	environmentally hazardous substance, liquid, N.O.S. (diethanolamine)
	Class	9*
	Packing Group	III
Marine Pollutant		not a marine pollutant
ERAP		Not Required



** NOTE: There is nothing to justify this classification (see Part 12). DEA is not particularly toxic to any aquatic species. DEA is considered "readily biodegradable". Finally, DEA is not classified as environmentally toxic in the European Union.*

15. REGULATIONS

Canada DSL	on inventory
U.S.A. TSCA	on inventory
Europe EINECS	on inventory
Australia AICS	on inventory
China IECSC	on inventory
Japan ENCS	on inventory
Korea IECS	on inventory
Philippines PICCS	on inventory

U.S.A. Regulations:

Allowable Tolerances: Diethanolamine is exempted from the requirement of a tolerance when used as a stabilizer for formulations used before crop emerges from soil in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only.

OSHA Standards: Vacated 1989 OSHA PEL TWA 3 ppm (15 mg/cu m) is still enforced in some states.

NIOSH Recommendations: Recommended Exposure Limit: 10 Hr Time-Weighted Avg: 3 ppm (15 mg/cu m).

Threshold Limit Values: 8 hr Time Weighted Avg (TWA): 2 mg/cu m, skin. Excursion Limit Recommendation: Excursions in worker exposure levels may exceed 3 times the TLV-TWA for no more than a total of 30 minutes during a work day, and under no circumstances should they exceed 5 times the TLV-TWA, provided that the TLV-TWA is not exceeded. 2008 Notice of Intended Changes: These substances, with their corresponding values and notations, comprise those for which (1) a limit is proposed for the first time, (2) a change in the Adopted value is proposed, (3) retention as an NIC is proposed, or (4) withdrawal of the Documentation and adopted TLV is proposed. In each case, the proposals should be considered trial values during the period they are on the NIC. These proposals were ratified by the ACGIH Board of Directors and will remain on the NIC for approximately one year following this ratification. If the Committee neither finds nor receives any substantive data that changes its scientific opinion regarding an NIC TLV, the Committee may then approve its recommendation to the ACGIH Board of Directors for adoption. If the Committee finds or receives substantive data that change its scientific opinion regarding an NIC TLV, the Committee may change its recommendation to the ACGIH Board of Directors for the matter to be either retained on or withdrawn from the NIC. Substance: Diethanolamine; Time Weighted Avg (TWA): 1 mg/cu m (Inhalable Fraction and Vapor); None; skin notation, A3: Confirmed animal carcinogen with unknown relevance to humans.; TLV Basis-Critical Effect(s): Liver & kidney damage.

Atmospheric Standards: Listed as a hazardous air pollutant (HAP) generally known or suspected to cause serious health problems. The Clean Air Act, as amended in 1990, directs EPA to set standards requiring major sources to sharply reduce routine emissions of toxic pollutants. EPA is required to establish and phase in specific performance based standards for all air emission sources that emit one or more of the listed pollutants. Diethanolamine is included on this list.

TSCA Requirements: Pursuant to section 8(d) of TSCA, EPA promulgated a model Health and Safety Data Reporting Rule. The section 8(d) model rule requires manufacturers, importers, and processors of listed chemical substances and mixtures to submit to EPA copies and lists of unpublished health and safety studies. Diethanolamine is included on this list. Section 8(a) of TSCA requires manufacturers of this chemical substance to report preliminary assessment information concerned with production, use, and exposure to EPA as cited in the preamble of the 51 FR 41329.

FFRA Requirements: Diethanolamine is exempted from the requirement of a tolerance when used as a stabilizer, inhibitor for formulations used before crop emerges from soil in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only.

FDA Requirements: Diethanolamine is an indirect food additive for use only as a component of adhesives.

16. OTHER INFORMATION

Prepared for Megaloid Laboratories by Peter Bursztyn, (705) 734-1577

Data from RTECS, HSDB (Haz. Substance Data Base), Cheminfo (CCOHS), IUCLID Datasheets (ESIS – European Chem. Substance Info. System), & others.

Preparation Date: November 2003 Revision Date: September 2006, December 2007, November 2010, November 2013

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