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MATERIAL SAFETY DATA SHEET

1,10-PHENANTHROLINE IN ETHANOL

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Date: 09/15/88

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Substance Identification

Trade Names/Synonyms: Phenanthroline; O-Phenanthroline; P=70

Chemical Family: Heterocyclic Nitrogen

Molecular Formula: $C_{12}H_{10}N_2O$

Molecular Weight: 198.23

Cercla Ratings (Scale 0-3): Health=1; Fire=3; Reactivity=0; Persistence=3

CAS-Number 5144-89-8

64-17-5

67-56-1

Components and Contaminants

Component: 1,10-Phenanthroline

Other Contaminants: Ethanol

Exposure Limits: Ethanol

200 PPM NIOSH Recommended TWA: 800 PPM NIOSH Recommended
15 Minute Ceiling

Physical Data

Description: Clear, colorless Liquid

Boiling Point: 172°F (78°C)

Melting Point: -172°F (-111°C)

Specific Gravity: 0.8

Vapor Pressure: 40 MMHG @ 20°C

Evaporation Rate: 1.14 (TTE)

Solubility in Water: Complete

Odor Threshold: 15-10 PPM

Vapor Density: 1.6

Solvent Solubility: Benzene, Ether, Acetone

Fire and Explosion Data

Fire and Explosion Hazard: Dangerous fire/negligible explosion hazard when exposed to heat or flame.

Vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back.

Vapor-air mixtures are explosive above flash point.

Flash Point: 57°F (14°C) (CC)

Upper Explosive Limit: 19%

Lower Explosive Limit: 4.3%

Autoignition Temperature: Not Available

Flammability Class (OSHA): 1B

Firefighting Media: Dry chemical, carbon dioxide, water spray or alcohol foam (1984 Emergency Response Guidebook, DOT P 5800.3).

For large fires, use dry chemical, carbon dioxide, or alcohol foam (1984 Emergency Response Guidebook, DOT P 5800.3).

Firefighting: Move container from fire area if possible. Cool fire-exposed containers with water from side until well after fire is out. For massive fire in storage area, use unmanned hose holder or monitor nozzles, else withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of storage tank due to fire (1984 Emergency Response Guidebook, DOT P 5800.3, Guide Page 26).

Extinguish only if flow can be stopped. Use flooding amounts of water as fog; solid streams may be ineffective. Cool containers with flooding amounts of water from as far a distance as possible. Avoid breathing vapors; keep upwind (Bureau of Explosives, Emergency Handling of Hazardous Materials in Surface Transportation, 1981).

Toxicity

Ethyl Alcohol: 20 PPM Eye-Human Irritation; 400 Mg Open Skin-Rabbit Irritation; 500 Mg/24 Hour Skin-Rabbit Severe Irritation; 79 Mg Eye-Rabbit Irritation; 100 Mg/4 Seconds Eye-Rabbit (Rinsed) Moderate Irritation. 2000 Mg/Kg Oral-Child LDLO; 50 Mg/Kg Oral-Man TDLO; 1430 Ug/Kg Oral-Man TDLO; 256 Gm/Kg/12 Weeks Oral-Woman TDLO; 20,000 PPM/10 Hours Inhalation-Rat LC50; 7060 Mg/Kg Oral-Rat LD50; 20 Gm/Kg Skin-Rabbit LDLO; 7800 Mg/Kg Oral-Mouse LD50; Mutagenic Data (RTECS); Reproductive Effects Data (RTECS); Tumorigenic Data (RTECS); Carcinogen Status: None. An eye and respiratory irritant and central nervous system depressant.

Methyl Alcohol: 5 PPM Eye-Human Irritation; 500 Mg/24 Hour Skin-Rabbit Moderate Irritation; 40 Mg Eye-Rabbit Moderate Irritation; 340 Mg/Kg Oral-Human LDLO; 13Gm/Kg Oral-Man LDLO; 86,000 Mg/M3 Inhalation-Human TCLO; 5628 Mg/Kg Oral-Rat LD50; 64,000 PPM/4 Hours Inhalation-Rat LC50; 20 Gm/Kg Skin Rabbit LD50; Mutagenic Data (RTECS); Reproductive Effects Data (RTECS); Carcinogenic Status: None.

Health Effects and First Aid

Inhalation: Narcotic/Irritant

25,000 PPM Methyl Alcohol is immediately dangerous to life or health.

Acute Exposure-Ethyl alcohol may cause nasal irritation, cough, and at high levels, a feeling of suffocation. Central nervous system depression may occur.

Methyl alcohol may cause symptoms of inebriation. Within 12-18 hours, headache, anorexia, weakness, fatigue, leg cramps, vertigo and restlessness occur, followed by nausea, vomiting, diarrhea, dizziness, narcosis and other signs of central nervous system depression. Severe abdominal, back and leg pains, muscular incoordination, sweating, tracheitis and bronchitis may ensue. Apathy or delirium may progress to coma. Excitement, mania and convulsions occur rarely. Blurred or dimmed vision has occurred, followed by transient or permanent blindness, with optic neuritis, eye pain and atrophy, concentric visual fields, and photophobia. Acidosis may result in rapid, shallow respiration, cyanosis, coma and hypotension. Mild tachycardia, cardiac depression and peripheral neuritis are possible, as well as liver and kidney damage and cerebral and pulmonary edema. Death is possible from respiratory failure or circulatory collapse. Prolonged asthenia and partial or complete loss of vision in 2-6 days, and permanent renal dysfunction may follow non-fatal intoxication.

Chronic Exposure-Repeated or prolonged exposure to ethyl alcohol may cause respiratory irritation, headache, and symptoms of central nervous system depression, such as lack of concentration and somnolence.

Methyl alcohol may cause visual impairments as described in acute inhalation. See animal mutagenic, reproductive effects and tumorigenic data references in the toxicity section.

First Aid-Remove from exposure area to fresh air immediately. If breathing has stopped, perform artificial respiration. Keep person warm and at rest. Get medical attention immediately.

Skin Contact: Irritant/Narcotic

Acute Exposure-Ethyl alcohol causes no immediate irritating effects.

Methyl alcohol may defat the skin and cause mild dermatitis. It is readily absorbed through the skin and may cause symptoms as with acute inhalation, principally acidosis, central nervous system depression and optic neuritis.

Chronic Exposure-Repeated or prolonged exposure to ethyl alcohol may cause dermatitis. Methyl alcohol may cause eczema, redness and scaling.

First Aid-Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

Eye Contact: Corrosive

Acute Exposure-Ethyl alcohol vapors at 5,000-10,000 ppm may cause temporary irritation. Direct contact may cause immediate burning, lacrimation, temporary injury of the cornea and hyperemia of the conjunctiva.

Methyl alcohol may cause superficial corneal lesions.

Chronic Exposure-Repeated or prolonged exposure to ethyl alcohol may cause conjunctivitis.

Blurred or dimmed vision followed by transient or permanent blindness, with optic neuritis, eye pain and atrophy, concentric visual fields, and photophobia may occur from inhalation, skin absorption or ingestion of methyl alcohol.

First Aid-Wash eyes immediately with large amounts of water, occasionally lifting upper and lower lids, until no evidence of chemical remains (at least 15-20 minutes). In case of burns, apply sterile bandages loosely without medication. Get medical attention immediately.

Ingestion: Narcotic

Acute Exposure-Ethyl alcohol may cause emotional instability and decreased inhibitions, with exhilaration, boastfulness, talkativeness, remorse and belligerency. Moderate intoxication leads to impaired muscular coordination, slowed reactions, slurred speech, ataxis, and slight visual disturbance. Severe poisoning results in sensory disturbance or loss, with vertigo and diplopia, flushing of the face, rapid pulse, sweating, nausea and vomiting, and involuntary defecation and urination. Central nervous system depression is indicated by dizziness, drowsiness, stupor and other signs of narcosis, progressing to coma, with impaired or absent tendon reflexes. Convulsions may occur from hypoglycemia. The pupils may be normal or dilated. Shock may follow, with hypotension, tachycardia, cold pale skin, and hypothermia. Respiration may be slow. Death may occur from respiratory or circulatory failure or from aspiration pneumonitis. Recovery from poisoning may be accompanied by headache, gastritis, infection or psychoses with uncontrollable fear, insomnia, tremors and restlessness followed by visual, auditory or gustatory hallucinations. Exaggerated reflexes, tachycardia and convulsions are possible.

Methyl alcohol may cause symptoms as with acute inhalation from acidosis and central nervous system depression. Blurred or dimmed vision, followed by transient or permanent blindness, with optic neuritis, eye pain and atrophy, concentric visual fields and photophobia may occur. Cardiac depression, peripheral neuritis, liver and kidney damage and cerebral and/or circulatory collapse. Prolonged asthenia and partial or complete loss of vision in 2-6 days and permanent renal dysfunction may follow non-fatal intoxication.

First Aid-If victim is conscious and not convulsing, immediately give 2 to 4 glasses of water. Induce vomiting by touching finger to back of throat. Then give 1 ounce (30ml) of milk of magnesia. Get medical attention immediately.

Reactivity

Generally stable under normal conditions. Highly volatile. Contact with strong oxidizers and incompatibles may cause fires and explosions. The substance reacts with alkali metals to liberate flammable hydrogen gas.

Incompatibilities: Violent reaction with nitric acid, acetyl chloride and acetyl bromide. Ignition may occur in reactions with bromine pentafluoride, chromic anhydride, chromyl chloride, permanganic acid, platinum, potassium dioxide, potassium-tert-butoxide and hydrogen peroxide/sulfuric acid mixtures. Explosions may occur from reactions with aluminum sesquibromide ethylate, bromine pentafluoride, calcium hypochlorite, hydrogen peroxide-sulfuric acid mixtures, iodine-mercuric oxide mixtures, manganese perchlorate-2,2-dimethoxy propane mixtures, some perchlorates recrystallized from ethanol (such as silver perchlorate and uranyl perchlorate), perchloric acid, permanganates treated with sulfuric acid, permanganic acid, potassium superoxide, sodium hydrazide and sulfuric acid-sodium dichromate mixtures. Explosive compounds may be formed in reactions with ammonium hydroxide-silver(I) oxide mixtures, hydrogen peroxide, iodine-phosphorus, silver/nitric acid and silver nitrate. Chromyl chloride causes ethanol and ammonia to ignite. Contact with strong oxidizers may cause fires or explosions. Reactions with alkali metals liberate flammable hydrogen gas. (Ethyl Alcohol)

Methanol:

Calcium Carbide: Reacts Violently
Magnesium: Reacts Violently
Cyanuric Chloride: Reacts Violently
Beryllium Hydride: Reacts Intensely at 200°C
Bromine: Reacts Intensely Exothermic
Nickel and Nickel Catalyst: Possible Ignition
Chloroform/Sodium Hydroxide Mixtures: Reacts Explosively
Chromic Anhydride: Possible Explosion
Strong Oxidizers: Possible Ignition and Explosion

Decomposition: Combustion may release toxic oxides of carbon.

Conditions to Avoid

May be ignited by heat, sparks or flames. Container may explode in heat of fire. Vapor explosion and poison hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard.

Spill and Leak Procedures

Occupational Spill: Shut off ignition sources. Do not touch spilled material. Stop leak if you can do it without risk. Use water spray to reduce vapors. For small spills, take up with sand or other absorbent material and place into containers for later disposal. For larger spills, dike far ahead of spill for later disposal. No smoking, flames or flares in hazard area! Keep unnecessary people away; isolate hazard area and deny entry.

Protective Equipment

Ventilation: Provide local exhaust ventilation and/or general dilution ventilation to meet published exposure limits.

Respirator: 33,000 ppm (lower explosive limit)-supplied-air respirator with separate air supply.

Firefighting: Self-contained breathing apparatus with a full face-piece operated in pressure-demand or other positive pressure mode.

Operations with a respirator are not recommended above the lower explosive limit (3.3%).

Clothing: Employee must wear appropriate protective (impervious) clothing and equipment to prevent repeated or prolonged skin contact with this substance.

Gloves: Employee must wear appropriate protective gloves to prevent contact with this substance.

Eye Protection: Employee must wear splash-proof or dust-proof safety goggles to prevent this liquid from contacting the eye. Do not wear contact lenses when working with chemical