

MSDS – MATERIAL SAFETY DATA SHEET

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KARL FISCHER REAGENT

(Pyridine-Free Single Solution)

1. Product Identification

Synonyms: Ethylene glycol monomethyl ether solution.

CAS No.: Not applicable to mixtures.

Molecular Weight: Not applicable to mixtures.

Chemical Formula: Not applicable to mixtures.

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Iodine	7553-56-2	10 - 20%	Yes
Sulfur Dioxide	7446-09-5	5 - 10%	Yes
Diethanolamine	111-42-2	5 - 10%	Yes
2-Methoxyethanol	109-86-4	35 - 60%	Yes

3. Hazards Identification

Emergency Overview

DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. CORROSIVE. CAUSES BURNS TO ANY AREA OF CONTACT. VAPOR IS SEVERELY IRRITATING TO EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM, BLOOD AND BLOOD FORMING ORGANS, REPRODUCTIVE SYSTEM, LIVER, CARDIOVASCULAR SYSTEM, AND KIDNEYS. FLAMMABLE LIQUID AND VAPOR. POSSIBLE BIRTH DEFECT HAZARD. MAY CAUSE BIRTH DEFECTS BASED ON ANIMAL DATA. MAY FORM EXPLOSIVE PEROXIDES IN AIR.

SAFETY DATA Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)

Flammability Rating: 2 - Moderate

Reactivity Rating: 2 - Moderate

Contact Rating: 3 - Severe (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:

Inhalation causes severe irritation to the respiratory tract. Symptoms of overexposure include headache, dizziness, nausea, shortness of breath, coughing, insomnia, diarrhea, gastrointestinal disturbances, and back pain with urinary frequency. Liver and kidney damage may occur. May be fatal. May cause pulmonary edema, a medical emergency.

Ingestion:

Highly Toxic! Complex hazard, with gastrointestinal irritation and possible corrosive attack due to the iodine and sulfur dioxide complexes and general impact due to the effects of ingesting methoxyethanol. Soreness, nausea, vomiting and abdominal pain are all possible symptoms. May also cause hemorrhagic gastritis, liver damage, pancreas damage, brain edema, kidney damage, central nervous system effects, systemic iodine poisoning, stupor and shock. May be fatal.

Skin Contact:

Corrosive. Symptoms of redness, pain, and severe burn can occur. May be absorbed through the skin with possible systemic effects. Photosensitizer.

Eye Contact:

Corrosive! Vapors are severely irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Chronic Exposure:

Prolonged or repeated skin exposure may cause dermatitis. May cause respiratory injury, damage to blood and blood forming organs, tooth effects, central nervous system damage, toxic encephalopathy, allergic sensitization, iodism, kidney and liver damage after long exposure. Based on animal tests, sulfur dioxide and 2-methoxyethanol may cause adverse reproductive system effects. 2-methoxyethanol is also a suspect birth defect hazard.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders, eye problems, impaired respiratory function, central nervous system disorders, blood disorder, or disease of the thyroid, lungs, liver or kidney may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Flash point: 45.5C (115F) CC

Flammable liquid. Dangerous fire hazard when exposed to heat, sparks, or flames.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Sealed containers may rupture when heated. Contact with strong oxidizers may cause fire. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Isolate or enclose the area of the leak or spill. Keep spills out of surface waters, sewers, or confined areas. Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Protect from moisture. Be aware of possible peroxide formation. Avoid use of aluminum and magnesium equipment. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Sudden release of hot organic chemical vapors or mists from process

equipment operating at elevated temperatures and pressure, or sudden ingress of air into vacuum equipment, may result in ignitions without the presence of ignition sources. Published "autoignition" or "ignition" temperature values cannot be treated as safe operating temperatures in chemical processes without analysis of the actual process conditions.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL):

2-Methoxyethanol: 25 ppm (TWA) skin (Methyl cellosolve)

Iodine: 0.1 ppm Ceiling

Sulfur dioxide: 5 ppm (TWA)

Diethanolamine: 3ppm (TWA)

-ACGIH Threshold Limit Value (TLV) :

2-Methoxyethanol: 0.1 ppm (TWA) skin (EGME)

Iodine: 0.1 ppm Ceiling

Sulfur Dioxide: 2 ppm (TWA), 5 ppm (STEL),

Diethanolamine: 2mg/m³ (TWA)

NIOSH Recommended Exposure Limit:

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airtight hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). This substance has unknown warning properties. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible.

Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance: Reddish-brown liquid.

Odor: Strong, Irritating.

Solubility: Miscible in water.

Specific Gravity: 1.14

pH: No information found.

% Volatiles by volume @ 21C (70F): 100

Boiling Point: Not applicable.

Melting Point: No information found.

Vapor Density (Air=1): No information found.

Vapor Pressure (mm Hg): No information found.

Evaporation Rate (BuAc=1): No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. 2-Methoxyethanol Component: Formation of explosive peroxides has been reported from auto-oxidation. Reported to dissolve aluminum from scratched or heated aluminum surfaces. Do not distill to dryness. Avoid excessive temperatures or prolonged reflux, such as in batch distillations.

Hazardous Decomposition Products:

Oxides of sulfur, iodine, oxides of carbon and nitrogen.

Hazardous Polymerization: Will not occur.

Incompatibilities:

The components of this material are incompatible with a wide variety of materials including: water, maleic anhydride, reducing agents, alkali metals, strong oxidizers, strong acids, and hydrides.

Conditions to Avoid:

Heat, flame, ignition sources, air, incompatibles

11. Toxicological Information

Toxicological Data:

2-Methoxyethanol Component: Oral rat LD50: 2370 mg/kg; inhalation rat LC50: 1500 ppm/7H; skin rabbit LD50: 1280 mg/kg. Investigated as a tumorigen, mutagen, reproductive effector.

Sulfur dioxide: inhalation rat LC50: 2520 ; ppm/1H. Investigated as a tumorigen, mutagen, reproductive effector.

Iodine Component: Oral rat LD50: 14 gm/kg; oral human LDLO: 28 mg/kg. Investigated as a reproductive effector.

Diethanolamine: 620 uL/kg; skin rabbit LD50: 7,640 uL/kg; irritation, standard Draize, eye rabbit: 750 ug/24H severe; skin rabbit: 500 mg/24H mild; investigated as a tumorigen, reproductive effector.

Reproductive Toxicity:

In tests with laboratory animals, exposure to 2-Methoxyethanol has resulted in an increase in birth defects, adverse effects on pregnancy, embryonic death, blood damage and damage to male reproductive organs. Acceptable maximum exposure limit for women of childbearing age = 2 ppm (8 Hr time-averaged average).

-----\Cancer Lists\-----

Ingredient Category	---NTP Carcinogen---		
	Known	Anticipated	IARC
Iodine (7553-56-2)	No	No	None
Sulfur Dioxide (7446-09-5)	No	No	3
Diethanolamine (111-42-2)	No	No	3
2-Methoxyethanol (109-86-4)	No	No	None

12. Ecological Information

Environmental Fate:

2-Methoxyethanol Component:

When released into the soil, this material may leach into groundwater. When released into the soil, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.

Environmental Toxicity:

2-Methoxyethanol Component: The LC50/96-hour values for fish are over 100 mg/l. This material is not expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: FLAMMABLE LIQUID, TOXIC, N.O.S. (KARL FISCHER REAGENT)

Hazard Class: 3

UN/NA: UN1993

Packing Group: II

Information reported for product/size: 2.5L

International (Water, I.M.O.)

Proper Shipping Name: FLAMMABLE LIQUID, TOXIC, N.O.S. (KARL FISCHER REAGENT)

Hazard Class: 3

UN/NA: UN1993

Packing Group: II

Information reported for product/size: 2.5L

International (Air, I.C.A.O.)

Proper Shipping Name: FLAMMABLE LIQUID, TOXIC, N.O.S. (KARL FISCHER REAGENT)

Hazard Class: 3

UN/NA: UN1993

Packing Group: II

Information reported for product/size: 2.5L

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
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Iodine (7553-56-2)	Yes	Yes	No	Yes
Sulfur Dioxide (7446-09-5)	Yes	Yes	Yes	Yes

Diethanolamine (111-42-2)	Yes	Yes	Yes	Yes
2-Methoxyethanol (109-86-4)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----

Ingredient	--Canada--			
	Korea	DSL	NDSL	Phil.
Iodine (7553-56-2)	Yes	Yes	No	Yes
Sulfur Dioxide (7446-09-5)	Yes	Yes	No	Yes
Diethanolamine (111-42-2)	Yes	Yes	No	Yes
2-Methoxyethanol (109-86-4)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----

Ingredient	-SARA 302-		-----SARA 313-----	
	RQ	TPQ	List	Chemical Catg.
Iodine (7553-56-2)	No	No	No	No
Sulfur Dioxide (7446-09-5)	500	500	No	No
Diethanolamine (111-42-2)	No	No	Yes	No
2-Methoxyethanol (109-86-4)	No	No	Yes	No

----\Federal, State & International Regulations - Part 2\-----

Ingredient	CERCLA	-RCRA-	-TSCA-
		261.33	8(d)
Iodine (7553-56-2)	No	No	No
Sulfur Dioxide (7446-09-5)	1	No	No
Diethanolamine (111-42-2)	100	No	Yes
2-Methoxyethanol (109-86-4)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
 SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
 Reactivity: No (Mixture / Liquid)

WARNING:

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 2[S]

Poison Schedule: S6

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 3 Flammability: 3 Reactivity: 2

Label Hazard Warning:

DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. CORROSIVE. CAUSES BURNS TO ANY AREA OF CONTACT. VAPOR IS SEVERELY IRRITATING TO EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM, BLOOD AND BLOOD

FORMING ORGANS, REPRODUCTIVE SYSTEM, LIVER, CARDIOVASCULAR SYSTEM, AND KIDNEYS. FLAMMABLE LIQUID AND VAPOR. POSSIBLE BIRTH DEFECT HAZARD. MAY CAUSE BIRTH DEFECTS BASED ON ANIMAL DATA. MAY FORM EXPLOSIVE PEROXIDES IN AIR.

Label Precautions:

- Keep away from heat, sparks and flame.
- Do not get in eyes, on skin, or on clothing.
- Do not breathe vapor.
- Keep container closed.
- Use only with adequate ventilation.
- Wash thoroughly after handling.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information: No Changes.

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