Fuel Cell Procedure

Document No.:	Title/Description:		
3350-00004	Spill Response Procedure		
Author:	**Approved by:**	**Revision:**	**Effective Date:**
Kurt Stiffel		1-00	

Required PPE and Safety Notes

All personnel within a 25 foot radius of the buoy are required to don splash protection goggles and chemical resistant gloves. These can include polyvinyl plastic, neoprene or rubber.

Contact information for **WHOI EH&S** is 508-289-3347.

Ensure operations are performed in compliance with applicable WHOI/SIO/OSU safety protocols, OOI Safety Plan (1006-10002) and CGSN EH&S Plan (3101-00009). Read and follow all safety warnings in the MSDS.

FUEL SPILL RESPONSE

AT SEA: Notify the ship's bridge that a spill has occurred.

ON SHORE: Notify the institutional safety office that a spill has occurred:

WHOI EH&S (508) 289-2911 or x2911

OSU EH&S (541) 737-2273

Attend to any person that has been exposed to the Methanol Fuel, utilizing emergency eye washes and showers.

Shut off all potential ignition sources in the immediate area.

Alert all other personnel that may be affected by the spill.

Review the Safety Data Sheet (SDS is attached) to familiarize yourself with the hazards, spill procedures and PPE required to deal with the spill.

Incidental Spills: For small, manageable volumes, clean up spill using absorbent mats and pillows from the Spill Kits (large fluorescent green barrels). Dispose of the used materials into the Spill Kit container.

Hazardous Spills: For larger spills that cannot be managed, limit the area of the spill as much as possible by using absorbent booms from the Spill Kits. Contact either the ship's bridge or local EH&S to report the spill and request assistance of the Emergency Response Team.

In cases where the Fuel Cell Bladder has a leak that is not possible to stop, refer to document 3350-00003 Fuel Cell Drain Procedure. This will instruct you on how to remove the fuel from the Fuel Cell Bladder and return it to the transportation drums.

Attachment #1 – Methanol Fuel SDS Sheet

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MATERIAL SAFETY DATA SHEET

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

Product: 63% Methanol Fuel

Non-Emergency Tel: +1.508.490.9960
Emergency Tel: Consult local telephone directory for poison control or emergency number(s)

Manufacturer: Protonex Technology Corporation
153 Northboro Road
Southborough, MA 01772

Product Use: Fuel for reformed methanol fuel cell

SECTION 2 – COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENT	**% (w/w)**	**Exposure Limits***
Methanol (CH_3OH) (CAS 67-56-1)	62-64	ACGIH TLV-TWA: 200 ppm, skin STEL: 250ppm, skin notation OSHA PEL: 200 ppm
NON-HAZARDOUS COMPONENTS	**% (w/w)**	
De-ionized Water (H_2O) (CAS 7732-18-5)	Balance	

* Check with local regulatory agency for the exposure limits in your area.

SECTION 3 - HAZARDS IDENTIFICATION

Routes of Entry

Skin Contact: Moderate **Eye Contact: Moderate** **Ingestion: Major** **Inhalation: Major**

Effects of Short-Term (Acute) Exposure

Inhalation: Inhalation of high airborne concentrations can also irritate mucous membranes, cause headaches, sleepiness, nausea, confusion, loss of consciousness, digestive and visual disturbances and even death. NOTE: Odor threshold of methanol is several times higher than the TLV-TWA. Depending upon severity of poisoning and the promptness of treatment, survivors may recover completely or may have permanent blindness, vision disturbances and/or nervous system effects. Concentrations in air exceeding 1000 ppm may cause irritation of the mucous membranes.

Skin Contact: Methanol is moderately irritating to the skin. Methanol can be absorbed through the skin and harmful effects have been reported by this route of entry. Effects are similar to those described in "Inhalation"

Eye Contact: Methanol is a mild to moderate eye irritant. High vapor concentration or liquid contact with eyes causes irritation, tearing and burning.

Ingestion: Swallowing even small amounts of methanol could potentially cause blindness or death. Effects of sub lethal doses may be nausea, headache, abdominal pain, vomiting and visual disturbances ranging from blurred vision to light sensitivity.

Effects of Long-Term (Chronic) Exposure

Repeated exposure by inhalation or absorption may cause systemic poisoning, brain disorders, impaired vision and blindness. Inhalation may worsen conditions such as emphysema or bronchitis. Repeated skin contact may cause dermal irritation, dryness and cracking.

Medical Conditions Aggravated By Exposure

Emphysema or bronchitis.

SECTION 4 – FIRST AID MEASURES

Note: Emergency assistance may also be available from the local poison control center.

Eye Contact: Remove contact lenses if worn. In case of contact, immediately flush eyes with plenty of clean running water for at least 15 minutes, lifting the upper and lower eyelids occasionally. Obtain medical attention.

Skin Contact: In case of contact, remove contaminated clothing. In a shower, wash affected areas with soap and water for at least 15 minutes. Seek medical attention if irritation occurs or persists. Wash clothing before reuse.

Inhalation: Remove to fresh air, restore or assist breathing if necessary. Obtain medical attention.

Ingestion: Swallowing methanol is potentially life threatening. Onset of symptoms may be delayed for 18 to 24 hours after digestion. If conscious and medical aid is not immediately available, do not induce vomiting. In actual or suspected cases of ingestion, transport to medical facility immediately.

NOTE TO PHYSICIAN: Acute exposure to methanol, either through ingestion or breathing high airborne concentrations can

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result in symptoms appearing between 40 minutes and 72 hours after exposure. Symptoms and signs are usually limited to CNS, eyes and gastrointestinal tract. Because of the initial CNS's effects of headache, vertigo, lethargy and confusion, there may be an impression of ethanol intoxication. Blurred vision, decreased acuity and photophobia are common complaints. Treatment with ipecac or lavage is indicated in any patient presenting within two hours of ingestion. A profound metabolic acidosis occurs in severe poisoning and serum bicarbonate levels are a more accurate measure of severity than serum methanol levels. Treatment protocols are available from most major hospitals and early collaboration with appropriate hospitals is recommended.

SECTION 5 – FIRE FIGHTING MEASURES

Flash Point:	**18°C**
Auto Ignition Temperature:	**385°C (NFPA 1978)**
Lower Flammability Limit:	**6.0% (v/v)**
Upper Flammability Limit:	**36.5% (v/v)**
Sensitivity to Impact:	**Low**
Sensitivity to Static Discharge:	**Low**
Hazardous Combustion Products:	Toxic gases and vapors; oxides of carbon and formaldehyde.
Extinguishing Media – Small Fires:	Dry chemical, CO_2, water spray
Extinguishing Media – Large Fires:	Water spray, AFFF(R) (Aqueous Film Forming Foam (alcohol resistant)) type with either a 3% or 6% foam proportioning system.
Fire Fighting Instructions:	Methanol burns with a clean clear flame that is almost invisible in daylight. Stay upwind! Isolate and restrict area access. Concentrations of greater that 25% methanol in water can be ignited. Use fine water spray or fog to control fire spread and cool adjacent structures or containers. Contain fire control water for later disposal. Fire fighters must wear full face, positive pressure, self-contained breathing apparatus or airline and appropriate protective clothing. Protective fire fighting structural clothing is not effective protection from methanol. Do not walk through spilled product.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) HAZARD INDEX:

HEALTH	**BLUE**	**1**
FLAMMABILITY	**RED**	**3**
REACTIVITY	**YELLOW**	**0**
SPECIAL HAZARD	**WHITE**	**None**

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Overview: Flammable liquid which can burn without a visible flame. Release can cause an immediate risk of fire and explosion. Eliminate all ignition sources, stop leak and use absorbent materials. If necessary, contain spill by diking. Fluorocarbon alcohol resistant foams may be applied to spill to diminish vapor and fire hazard. Restrict access to area until completion of cleanup. Wear adequate personal protection.

Environmental Precautions: Biodegrades easily in water. Methanol in fresh or salt water may have serious effects on aquatic life. Methanol will be broken down to carbon dioxide and water.

Small Spills: Dilute with water to reduce fire hazard. Soak up spill with non-combustible absorbent material. Prevent spills from entering sewers, confined spaces, drains, or waterways. Put material in suitable, covered, labeled containers and dispose in accordance with local regulations. Flush area with water.

SECTION 7 – HANDLING & STORAGE

Handling Procedures: No smoking or open flame in storage, use or handling areas. Handle open container with care. After handling, always wash hands thoroughly with soap and water. Keep away from children

Storage: Store and use away from heat, sparks, open flame and any other ignition source. Keep away from incompatibles. Keep in a cool, well ventilated area.

SECTION 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls: For normal application, special ventilation is not necessary. If user's operations generate vapor or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.

Eye and Face: Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.

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Body: Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory Protection: NIOSH approved supplied air respirator when airborne concentrations exceed exposure limits.
Hands: If this material may come in contact with the hands during handling and use, we recommend wearing gloves of the following material(s): fluoroelastomer, natural rubber latex, neoprene, polyvinyl chloride (PVC). Do not use: polyvinyl alcohol (PVA)
Feet: Wear appropriate footwear to prevent product from coming in contact with feet and skin.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Liquid, clear colorless	**Boiling Point:**	73°C -74°C
Odor:	Mild characteristic alcohol odor	**Critical Temperature:**	239°C
Odor Threshold:	Highest known is 100 ppm	**Relative Density:**	0.88g/cc@20°C
pH:	Not Applicable	**Solubility:**	Completely soluble
Vapor Pressure:	58 torr@20°C		
Vapor Density:	1.1@20°C (air=1.1)		

SECTION 10 – STABILITY AND REACTIVITY

Corrosivity:	Not Applicable
Stability:	The product is stable under normal operating conditions.
Incompatibility:	Avoid contact with strong oxidizers, strong mineral or organic acids, and strong bases. Contact with these materials may cause a violent or explosive reaction. May be corrosive to lead, aluminum, magnesium, and platinum.
Conditions of Reactivity:	Presence of incompatible materials and ignition sources.
Hazardous Decomposition Products:	Formaldehyde, carbon dioxide, and carbon monoxide.
Hazardous Polymerization:	Will not occur

SECTION 11 – TOXICOLOGICAL INFORMATION

LD_{50}:	5628 mg/kg (oral/rat), 20 ml/kg (dermal/rabbit)
LC_{50}:	64,000 ppm (rat)
Acute Exposure:	See Section 3
Chronic Exposure:	See Section 3
Exposure Limits:	See Section 2
Irritancy:	See Section 3
Sensitization:	No
Carcinogenicity:	Not listed by IARC, NTP, ACGIH, or OSHA as a carcinogen
Teratogenicity:	No
Reproductive toxicity:	Reported to cause birth defects in rats exposed to 20,000 ppm
Mutagenicity:	Insufficient Data
Synergistic Products:	None Known

SECTION 12 – ECOLOGICAL INFORMATION

Environmental Fate:	Not Available
Bioaccumulation Potential:	Not Available
Biodegradability:	Biodegrades easily in water

SECTION 13 – DISPOSAL CONSIDERATION

Waste Disposal: Preferred waste management priorities are: (1) recycle or reprocess; (2) incineration with energy recovery; (3) disposal at licensed waste disposal facility. Ensure that disposal or reprocessing is in compliance with government requirements and local disposal regulations. Consult your local or regional authorities.

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SECTION 14 – TRANSPORT INFORMATION

Transport of Dangerous Goods (TDG and CLR):	Methanol, Class 3(6.1) UN1230, PG II Limited Quantity:≤ 1 liter
US Department of Transportation (49CFR):	Methanol, Class 3, UN1230, PG II (RQ 5000 lbs./2270kg.) Limited Quantity:≤ 1 liter
International Air Transport Association (IATA)::	Methanol, Class 3(6.1), UN1230, P.G. II Packaging Instruction: 305, Limited Quantity:≤ 1 liter

SECTION 15 – REGULATORY INFORMATION

29CFR 1910.1200 (OSHA):	Hazardous
40CFR 116-117 (EPA):	Hazardous
40CFR 355, Appendices A and B:	Subject to Emergency Planning and Notification
40CFR 372 (SARA Title III):	Listed
40CFR 302 (CERCLA):	Listed

SECTION 16 – OTHER INFORMATION

Disclaimer: The information above is believed to be accurate and represents the best information currently available to us. Users should make their own investigations to determine the suitability of the information for their particular purposes. This document is intended as a guide to the appropriate precautionary handling of the material by a properly trained person using this product.

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Last Updated – 04 January 2010