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## MATERIAL SAFETY DATA SHEET

### 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**Product Name:** ECO2FUME® Fumigant Gas  
**Synonyms:** None  
**Chemical Family:** Mixture of phosphine and carbon dioxide  
**Molecular Formula:** Mixture  
**Molecular Weight:** Mixture

CYTEC INDUSTRIES INC., FIVE GARRET MOUNTAIN PLAZA, WEST PATERSON, NEW JERSEY 07424, USA  
For Product Information call 1-800/652-6013. Outside the USA and Canada call 1-973/357-3193.  
EMERGENCY PHONE: For emergency involving spill, leak, fire, exposure or accident call CHEMTREC: 1-800/424-9300. Outside the USA and Canada call 1-703/527-3887.

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### 2. COMPOSITION/INFORMATION ON INGREDIENTS

#### OSHA REGULATED COMPONENTS

Component / CAS No.	% (w/w)	OSHA (PEL):	ACGIH (TLV)	Carcinogen
Phosphine 7803-51-2	1.8 - 2.2	0.3 ppm	0.3 ppm 1 ppm STEL	-
Carbon dioxide 124-38-9	97.8 - 98.2	5,000 ppm	5,000 ppm 30,000 ppm STEL	-

### 3. HAZARDS IDENTIFICATION

#### EMERGENCY OVERVIEW

##### APPEARANCE AND ODOR:

Color: colorless  
Appearance: gas  
Odor: garlic

##### STATEMENTS OF HAZARD:

DANGER! POISONOUS LIQUID AND GAS UNDER PRESSURE  
MAY BE FATAL IF INHALED  
CONTACT WITH LIQUEFIED MATERIAL MAY CAUSE FROSTBITE

#### POTENTIAL HEALTH EFFECTS

EFFECTS OF OVEREXPOSURE:

The acute 1-hour inhalation LC50 (rat) is greater than 4026 ppm. This material contains ~98% of an asphyxiant gas (carbon dioxide) with ~2% of a material which is acutely toxic by inhalation (phosphine). Overexposure can cause nausea, headache, dizziness, drowsiness, loss of consciousness, coma, and death. Based on the physical form of this material, overexposure by the oral or dermal route is unlikely. However, direct contact with liquefied carbon dioxide can cause frostbite

Refer to Section 11 for toxicology information on the regulated components of this product.

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## 4. FIRST AID MEASURES

### **Ingestion:**

Not an expected route of exposure.

### **Skin Contact:**

Liquefied gas may cause frostbite if contact is made with skin. Treat as thermal burn. Remove contaminated clothing and shoes without delay. Get medical attention immediately. When vaporized, gas is not known to be absorbed through skin and skin contact is not an expected route of exposure.

### **Eye Contact:**

Never put oil or ointment into eyes without medical advice. In case of freezing or cryogenic burns by rapidly evaporating liquid, rinse eyes with cool water. Do not rinse eyes with hot or even warm water. Remove victim from source of contamination. Open eyelids wide to allow liquid to evaporate. In case of contact with gas, hold eyelids open and immediately wash continuously with cool water for at least 15 minutes. Obtain medical attention immediately.

### **Inhalation:**

Move person to fresh air. If person is not breathing, immediately call for emergency medical support then, begin cardiopulmonary resuscitation including artificial respiration, preferably with a bag-valve-mask device if possible. Rescuers within the areas of potentially unsafe levels of this product (the "HOT ZONE") should employ appropriate personal protective equipment such as SCBA during the rescue of the victim. Call a poison control center or doctor for further treatment advice.

### **Notes To Physician:**

This product is a gaseous mixture of phosphine (not phosgene) and carbon dioxide. Mild exposure by inhalation causes malaise, ringing of ears, fatigue, nausea and pressure in chest, which are relieved by removal to fresh air. Moderate poisoning causes weakness, vomiting, pain just above stomach, chest pain, diarrhea and difficulty breathing. Symptoms of severe poisoning may occur within a few hours or up to several days, resulting in pulmonary edema and may lead to dizziness, cyanosis, unconsciousness and death.

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## 5. FIRE-FIGHTING MEASURES

### **Extinguishing Media:**

Move containers from fire area if it can be done without risk. For small fires, use carbon dioxide or dry chemical to extinguish fires. For large fires, use water spray, fog or alcohol foam to extinguish fires.

### **Protective Equipment:**

Wear self-contained, positive pressure breathing apparatus and full firefighting protective clothing for fire situations only. See MSDS Section 8 (Exposure Controls/Personal Protection).

### **Special Hazards:**

In case of fire, stop flow of gas if possible. Keep cylinders cool by spraying with water if exposed to fire. Cylinders are not fitted with pressure relief devices and may explode if over-heated. Move cylinders from fire area if you can do it without risk. Withdraw immediately if cylinders can not be kept cool. Damaged cylinders should be handled only by a specialist.

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## 6. ACCIDENTAL RELEASE MEASURES

### Personal Precautions:

Where exposure level is not known, wear approved, positive pressure, self-contained respirator. Where exposure level is known, wear approved respirator suitable for level of exposure.

### Methods For Cleaning Up:

All releases can produce high levels of gas. Evacuate area. Stop leak if possible if it can be done without risk. Isolate area until gas has dispersed.

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## 7. HANDLING AND STORAGE

### HANDLING

**Precautionary Measures:** Do not breathe gas. Do not get in eyes, on skin or on clothing. Keep container tightly closed. Use with adequate ventilation. Keep cylinder out of sun and away from heat. Keep cylinder in an upright position and protect from falling. This gas deadens the sense of smell. Do not depend on odor to detect presence of gas. Read and follow Application Manual before using this product. X POISON X

**Handling Statements:** Cylinders must be handled in accordance with industry standards for compressed gases. Refer to the Compressed Gas Association (CGA) Pamphlet P-1 "Safe Handling of Compressed Gases In Containers". Phosphine gas may react with certain metals and cause corrosion, especially at higher temperatures and relative humidity. Metals such as brass, copper and other copper alloys and precious metals are susceptible to corrosion. Small electric motors, smoke detectors, brass sprinkler heads, batteries, chargers, forklifts, sensors, communication devices, computers and other electronic or electrical equipment should be protected or removed before fumigation.

### STORAGE

Cylinders should be stored in an assigned area which should be cool, dry, well ventilated and fire resistant. It is recommended that both full and used cylinders be stored outdoors in a dedicated and properly designed and labeled storage area, away from other building ventilation intakes. This area should be secured, locked and have a well-drained, firm and level surface, preferably reinforced concrete. Cylinders must be stored in an upright position and secured or protected from falling. Cylinders should never be stored where the temperatures will exceed 52 C (125 F). The indoor storage of toxic gases is prohibited in some jurisdictions. The storage of these gases in occupied spaces is not recommended. Indoor storage in a separate building with no other occupancy is suitable. The building should be adequately ventilated and equipped with a continuous monitoring and alarm system.

**Storage Temperature:** Store at <52 °C 125 °F

**Reason:** Safety

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## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### Engineering Measures:

All direct exposure to this material must be prevented.

### Respiratory Protection:

Where exposures are unknown or exceed the established exposure standard, use recommended respirator or full protective suit with air supply appropriate for the material and level of exposure. Where exposures are below the PEL, no respiratory protection is required. See governmental recommendations on respiratory protection such as US NIOSH 'GUIDE TO INDUSTRIAL RESPIRATORY PROTECTION'.

### Eye Protection:

Provide eye wash fountain and safety shower in close proximity to points of potential exposure. Prevent eye and skin contact. Safety glasses should be worn when working with pressurized equipment.

**Skin Protection:**

Wear leather work gloves or leather faced cotton gloves when connecting or disconnecting cylinders from dispensing equipment. Steel toed safety shoes are recommended for anyone handling compressed gas cylinders.

**Additional Advice:**

Food, beverages, and tobacco products should not be carried or consumed where this material is in use. Before eating, drinking, or smoking, wash face and hands thoroughly with soap and water.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Color:</b>	colorless
<b>Appearance:</b>	gas
<b>Odor:</b>	garlic
<b>Boiling Point:</b>	sublimes
<b>Melting Point:</b>	sublimes
<b>Vapor Pressure:</b>	47266mm Hg @ 25 °C
<b>Specific Gravity:</b>	Not applicable
<b>Vapor Density:</b>	1.53 @ 25 °C
<b>Percent Volatile (By Wt.):</b>	100
<b>pH:</b>	Not applicable
<b>Saturation In Air (% By Vol.):</b>	Not available
<b>Evaporation Rate:</b>	Not available
<b>Solubility In Water:</b>	Slight
<b>Volatile Organic Content:</b>	
<b>Flash Point:</b>	Not applicable
<b>Flammable Limits (% By Vol):</b>	Non-flammable mixture
<b>Autoignition Temperature:</b>	Not applicable
<b>Decomposition Temperature:</b>	Not available
<b>Partition coefficient (n-octanol/water):</b>	Not applicable
<b>Odor Threshold:</b>	See Section 2 for exposure limits.

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## 10. STABILITY AND REACTIVITY

<b>Stability:</b>	Stable
<b>Conditions To Avoid:</b>	None known
<b>Polymerization:</b>	Will not occur
<b>Conditions To Avoid:</b>	None known
<b>Materials To Avoid:</b>	Copper, brass and other copper alloys, precious metals
<b>Hazardous Decomposition Products:</b>	oxides of phosphorus oxides of carbon

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## 11. TOXICOLOGICAL INFORMATION

Toxicological information for the product is found under Section 3. HAZARDS IDENTIFICATION. Toxicological information on the regulated components of this product is as follows:

Phosphine has a 4-hour inhalation LC50 (rat) value of 57 ppm (0.079 mg/L). Inhalation overexposure is characterized by severe pulmonary irritation, dyspnea, dizziness, lethargy, and stupor. Human evidence indicates that pulmonary irritation and pulmonary edema are the main toxic effects of phosphine inhalation. Phosphine has also been shown to cause central nervous system depression and gastrointestinal irritation, as well as, renal and hepatic toxicity. Acute inhalation overexposure to high concentrations of phosphine can be fatal. In an in vivo cytogenetic study, rats exposed to phosphine via inhalation at concentrations of 0, 6.2 and 19 ppm were examined for chromosomal aberrations in whole blood lymphocytes and bone marrow cells. A significant increase in cells with chromosomal aberrations were seen in male rats exposed to 19 ppm phosphine. No increase in cells with chromosomal aberrations were observed in the bone marrow of female rats, nor in the whole blood lymphocytes of male or female rats.

Carbon dioxide, in a liquefied or solid state, can cause frostbite and freeze burns with contact. Carbon dioxide gas is an asphyxiant which depletes the amount of available oxygen in breathing air. Overexposure to carbon dioxide at low levels can cause headache, nausea, weakness, confusion, and labored breathing. Overexposure to higher concentrations can cause excitation, euphoria, dizziness, drowsiness, loss of consciousness, coma, and death. The 4-hour inhalation LC50 (rat) value is estimated to be >5,000 ppm.

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## 12. ECOLOGICAL INFORMATION

Environmental exposure from substances of this preparation are limited due to the physical form of the product.

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## 13. DISPOSAL CONSIDERATIONS

The information on RCRA waste classification and disposal methodology provided below applies only to the Cytec product, as supplied. If the material has been altered or contaminated, or it has exceeded its recommended shelf life, the guidance may be inapplicable. Hazardous waste classification under federal regulations (40 CFR Part 261 et seq) is dependent upon whether a material is a RCRA 'listed hazardous waste' or has any of the four RCRA 'hazardous waste characteristics.' Refer to 40 CFR Part 261.33 to determine if a given material to be disposed of is a RCRA 'listed hazardous waste'; information contained in Section 15 of this MSDS is not intended to indicate if the product is a 'listed hazardous waste.' RCRA Hazardous Waste Characteristics: There are four characteristics defined in 40 CFR Section 261.21-61.24: Ignitability, Corrosivity, Reactivity, and Toxicity. To determine Ignitability, see Section 9 of this MSDS (flash point). For Corrosivity, see Sections 9 and 14 (pH and DOT corrosivity). For Reactivity, see Section 10 (incompatible materials). For Toxicity, see Section 2 (composition). Federal regulations are subject to change. State and local requirements, which may differ from or be more stringent than the federal regulations, may also apply to the classification of the material if it is to be disposed. Cytec encourages the recycle, recovery and reuse of materials, where permitted, as an alternate to disposal as a waste. Cytec recommends that organic materials classified as RCRA hazardous wastes be disposed of by thermal treatment or incineration at EPA approved facilities. Cytec has provided the foregoing for information only; the person generating the waste is responsible for determining the waste classification and disposal method.

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## 14. TRANSPORT INFORMATION

This section provides basic shipping classification information. Refer to appropriate transportation regulations for specific requirements.

### US DOT

Proper Shipping Name: Liquefied gas, toxic, n.o.s. [Inhalation hazard - Zone D]

Hazard Class: 2.3

UN/ID Number: UN3162

Transport Label Required: Poison Gas

Technical Name (N.O.S.): Contains phosphine

Hazardous Substances:

<u>Component / CAS No.</u>	<u>Reportable Quantity of Product (lbs)</u>
Phosphine	4545.455

### TRANSPORT CANADA

Proper Shipping Name: Liquefied gas, toxic, n.o.s.

Hazard Class: 2.3

Packing Group: -

UN Number: 3162

Transport Label Required: Toxic Gas

Technical Name (N.O.S.): Contains phosphine

### ICAO / IATA

Proper Shipping Name: Liquefied gas, toxic, n.o.s.

Hazard Class: 2.3

Packing Group: -

UN Number: 3162

Transport Label Required: ---

Packing Instructions/Maximum Net Quantity Per Package:

Passenger Aircraft: -; FORBIDDEN

Cargo Aircraft: -; FORBIDDEN

Technical Name (N.O.S.): Contains phosphine

### IMO

Proper Shipping Name: Liquefied gas, toxic, n.o.s.

Hazard Class: 2.3

UN Number: 3162

Packing Group: -

Transport Label Required: Toxic Gas

Technical Name (N.O.S.): Contains phosphine

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## 15. REGULATORY INFORMATION

### INVENTORY INFORMATION

**United States (USA):** All components of this product are included on the TSCA Inventory in compliance with the Toxic Substances Control Act, 15 U. S. C. 2601 et. seq.

**Canada:** Components of this product have been reported to Environment Canada in accordance with Sections 66 and/or 81 of the Canadian Environmental Protection Act (1999), and are included on the Domestic Substances List.

**European Union (EU):** All components of this product are included in the European Inventory of Existing Chemical Substances (EINECS) in compliance with Council Directive 67/548/EEC and its amendments.

**Australia:** All components of this product are included in the Australian Inventory of Chemical Substances (AICS). Not to be available except to authorized or licensed persons. NRA Approval: File Number 50177

#### OTHER ENVIRONMENTAL INFORMATION

The following components of this product may be subject to reporting requirements pursuant to Section 313 of CERCLA (40 CFR 372), Section 12(b) of TSCA, or may be subject to release reporting requirements (40 CFR 307, 40 CFR 311, etc.) See Section 13 for information on waste classification and waste disposal of this product.

Component / CAS No.	%	TPQ(lbs)	RQ(lbs)	S313	TSCA 12B
Phosphine 7803-51-2	1.8 - 2.2	500	100	Yes	No

#### PRODUCT HAZARD CLASSIFICATION UNDER SECTION 311 OF SARA

- Acute
- Pressure generating

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## 16. OTHER INFORMATION

#### NFPA Hazard Rating (National Fire Protection Association)

Health: 2 - Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

Fire: 0 - Materials that will not burn.

Reactivity: 2 - Materials that readily undergo violent chemical change at elevated temperatures and pressures.

<b>Reasons For Issue:</b>	Revised Section 3
	Revised Section 4
	Revised Section 5
	Revised Section 6
	Revised Section 7
	Revised Section 8
	Revised Section 11
	Revised Section 14

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