

SAFETY DATA SHEET

1. IDENTIFICATION

Product Name: ECO2FUME® Fumigant Gas
Product Description: Physical mixture of phosphine and carbon dioxide
Synonyms: None
Chemical Family: Mixture of phosphine and carbon dioxide
Molecular Weight: Mixture
Intended/Recommended Use: Fumigant

CYTEC INDUSTRIES INC., 504 CARNEGIE CENTER, PRINCETON, NEW JERSEY 08540, USA

For Product and all Non-Emergency Information call 1-800/652-6013. Outside the USA and Canada call 1-973/357-3193.

EMERGENCY PHONE (24 hours/day) - For emergency only involving spill, leak, fire, exposure or accident call:

Asia Pacific:

Australia - +61 2 8014 4558 (Carechem24)
China (PRC) - +86 0532 83889090 (NRCC) +86 512 8090 3042 (Carechem24)
New Guinea - +61 2 8014 4558 (Carechem24)
New Zealand - +64 9 929 1483 (Carechem24)
India, Japan, Korea, Malaysia, Thailand - +65 3158 1074 (Carechem24 Singapore)
India (Hindi Speaking Only) - +65 3158 1198 or 000800 100 7479 (Carechem24 Singapore)

Canada: 800 424 9300 (Within US,Canada) +1 (703) 527-3887 (International) (CHEMTREC)

Europe/Africa/Middle East (Carechem24 UK):

Europe, Middle East, Africa, Israel - +44 1235 239 670
(Arabic speaking countries) - +44 1235 239 671

Latin America:

Brazil - +55 11 3197 5891 (Carechem24)
Chile - +56 2 2582 9336 (Carechem24)
All Others - +44 1235 239 670 (Carechem24 UK)

USA: 800 424 9300 (Within US,Canada) +1 (703) 527-3887 (International) (CHEMTREC)

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2. HAZARDS IDENTIFICATION

GHS Classification

Gases Under Pressure - Liquefied Gas
Acute Toxicity (Inhalation) Hazard Category 3
Skin Corrosion / Irritation Hazard Category 2
Serious Eye Damage / Eye Irritation Hazard Category 2A
Simple Asphyxiant

LABEL ELEMENTS



Signal Word

Danger

Hazard Statements

Contains gas under pressure; may explode if heated
 Toxic if inhaled
 Causes skin irritation
 Causes serious eye irritation
 May displace oxygen and cause rapid suffocation

Precautionary Statements

Avoid breathing dust/fume/gas/mist/vapours/spray.
 Use only outdoors or in a well-ventilated area.
 Wash face, hands and any exposed skin thoroughly after handling.
 Wear protective gloves/protective clothing/eye protection/face protection.
 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
 Call a POISON CENTER or doctor/physician.
 Specific treatment (see supplemental first aid instructions on this label).
 IF ON SKIN: Wash with plenty of soap and water.
 Take off all contaminated clothing and wash it before reuse.
 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 Protect from sunlight. Store in a well-ventilated place.
 Store in a well-ventilated place. Keep container tightly closed.
 Store locked up.
 Dispose of contents/container in accordance with local and national regulations.

Hazards Not Otherwise Classified (HNOC), Other Hazards

Contact with liquified gas may cause frostbite
 Asphyxiant gas - depletes available oxygen in breathing air
 Phosphine gas may react with certain metals and cause corrosion, especially at higher temperatures and relative humidity.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance, Mixture or Article? Mixture

HAZARDOUS INGREDIENTS

Component / CAS No.	%	GHS Classification	Carcinogen
Carbon dioxide 124-38-9	97.8 - 98.2	Acute Tox. 4 (H332)	-
Phosphine 7803-51-2	1.8 - 2.2	Flam. Gas 1 (H220) Press. Gas Acute Tox. 1 (H330) Skin Corr. 1B (H314) Eye Dam. 1 (H318) Aquatic Acute 1 (H400)	IARC 2A(as Non-arsenical insecticides)

The specific chemical identity and/or exact percentage of composition for one or more ingredients has been withheld as a trade secret.

Additional GHS classification or other information may be included in this section but has not been adopted by OSHA. See Section 16 for full text of H phrases.

4. FIRST AID MEASURES

DESCRIPTION OF FIRST AID MEASURES

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.

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.

Ingestion:

Not an expected route of exposure.

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.

MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

None known

INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDS

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.

5. FIRE-FIGHTING MEASURES

Suitable 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.

Extinguishing Media to Avoid:

full water jet

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.

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.

References to other sections:

See Sections 8 and 13 for additional information.

7. HANDLING AND STORAGE

HANDLING

Precautions: Use only outdoors or in a well-ventilated area. Wash hands thoroughly after handling. Avoid breathing gas. Wear protective gloves and eye/face protection.

Special 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. It is preferred to store cylinders at less than 52C (125 F), however it is safe to store cylinders at temperatures up to 60 C (140F). 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 <60 °C 140 °F

Reason: Safety.

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.

Hand Protection:

Wear impermeable gloves.

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. Hand trucks are the recommended means of moving individual ECO2FUME cylinders about the fumigation site to avoid manual handling injury. The hand truck should be designed specifically for compressed gas cylinders and equipped with a suitable chain or strap to ensure the cylinder remains in place. Cylinder lifter/trolley is also recommended for moving and lifting cylinders into elevated heights. Never move an ECO2FUME cylinder without valve cap and cylinder cap in place.

Exposure Limit(s)

The below constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

124-38-9 Carbon dioxide

OSHA (PEL):	5000 ppm (TWA) 9000 mg/m ³ (TWA)
ACGIH (TLV):	30000 ppm (STEL) 5000 ppm (TWA)
Other Value:	Not established

7803-51-2 Phosphine

OSHA (PEL):	0.3 ppm (TWA) 0.4 mg/m ³ (TWA)
ACGIH (TLV):	1 ppm (STEL) 0.3 ppm (TWA)
Other Value:	Not established

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	colorless
Odor:	garlic
Boiling Point:	sublimes
Melting Point:	sublimes
Vapor Pressure:	47266mm Hg @ 25 °C
Specific Gravity/Density:	Not applicable
Vapor Density:	1.53 @ 25 °C
Percent Volatile (% by wt.):	100
pH:	Not applicable
Saturation In Air (% By Vol.):	Not applicable
Evaporation Rate:	Not applicable
Solubility In Water:	Slight
Volatile Organic Content:	None
Flash Point:	Non Flammable
Flammability (solid, gas):	Not available
Flammable Limits (% By Vol):	Non-flammable mixture
Autoignition (Self) Temperature:	Not applicable
Decomposition Temperature:	Not available
Partition coefficient (n-octanol/water):	Not applicable
Odor Threshold:	Not available
Viscosity (Kinematic):	Not available

DUST HAZARD INFORMATION

Particle Size (microns):	Not applicable
Kst (bar-m/sec):	Not applicable
Maximum Explosion Pressure (Pmax):	Not applicable
Dust Class:	Not applicable
Minimum Ignition Energy (MIE) (mJ):	Not applicable
Minimum Ignition Temperature (MIT) (°C):	Not applicable
Minimum Explosive Concentration (MEC) (g/m³):	Not applicable
Limiting Oxygen Concentration (LOC) (%):	Not applicable

10. STABILITY AND REACTIVITY

Reactivity:	No information available
Stability:	Stable
Conditions To Avoid:	None known
Polymerization:	Will not occur
Conditions To Avoid:	None known
Materials To Avoid:	Copper, brass and other copper alloys, precious metals
Hazardous Decomposition Products:	oxides of phosphorus oxides of carbon

11. TOXICOLOGICAL INFORMATION

PRODUCT TOXICITY INFORMATION

Likely Routes of Exposure: Skin, Eyes, Respiratory System.

ACUTE TOXICITY DATA

oral (gavage)	rat	Acute LD50	Not an expected route of exposure
dermal	rabbit	Acute LD50	Not an expected route of exposure
inhalation	rat	Acute LC50 1 hr	4027 ppm (Gases)

LOCAL EFFECTS ON SKIN AND EYE

Acute Irritation	dermal	May cause frostbite
Acute Irritation	eye	May cause frostbite

ALLERGIC SENSITIZATION

Sensitization	dermal	No data
Sensitization	inhalation	No data

GENOTOXICITY

Assays for Gene Mutations

Ames Salmonella Assay	No data
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OTHER INFORMATION

Contact with liquified gas may cause frostbite
Asphyxiant gas - depletes available oxygen in breathing air

HAZARDOUS INGREDIENT TOXICITY DATA

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.

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. This material is pyrophoric and therefore, contact with skin or eyes may produce thermal burns. 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.

12. ECOLOGICAL INFORMATION

TOXICITY, PERSISTENCE AND DEGRADABILITY, BIOACCUMULATIVE POTENTIAL, MOBILITY IN SOIL, OTHER ADVERSE EFFECTS

This material is not classified as dangerous for the environment.

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

RESULTS OF PBT AND vPvB ASSESSMENT

Not determined

HAZARDOUS INGREDIENT TOXICITY DATA

Component / CAS No.	Toxicity to Algae	Toxicity to Fish	Toxicity to Water Flea
Carbon dioxide 124-38-9	Not available	Not available	Not available
Phosphine 7803-51-2	Not available	Not available	Not available

13. DISPOSAL CONSIDERATIONS

13. DISPOSAL CONSIDERATIONS

The information on RCRA waste classification and disposal methodology provided below applies only to the 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 3 (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. The Company encourages the recycle, recovery and reuse of materials, where permitted, as an alternate to disposal as a waste. The Company recommends that organic materials classified as RCRA hazardous wastes be disposed of by thermal treatment or incineration at EPA approved facilities. The Company has provided the foregoing for information only; the person generating the waste is responsible for determining the waste classification and disposal method.

14. TRANSPORT INFORMATION

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

US DOT

Dangerous Goods? X
 Proper Shipping Name: Liquefied gas, toxic, n.o.s
 Hazard Class: 2.3
 UN/ID Number: UN3162
 Inhalation Hazard: Toxic Inhalation Hazard - Zone D
 Transport Label Required: Poison Gas - Inhalation Hazard
 Technical Name (N.O.S.): Contains phosphine

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

Comments: Hazardous Substances/Reportable Quantities - DOT requirements specific to Hazardous Substances only apply if the quantity in one package equals or exceeds the product reportable quantity.

TRANSPORT CANADA

Dangerous Goods? X
 Proper Shipping Name: Liquefied gas, toxic, n.o.s.
 Hazard Class: 2.3
 UN Number: UN3162
 Transport Label Required: Toxic Gas
 Technical Name (N.O.S.): Contains phosphine

ICAO / IATA

Dangerous Goods? Forbidden

IMO

Dangerous Goods? X
 Proper Shipping Name: Liquefied gas, toxic, n.o.s.
 Hazard Class: 2.3

UN Number: UN3162
 Transport Label Required: Toxic Gas
 Technical Name (N.O.S.): Contains phosphine

15. REGULATORY INFORMATION

Inventory Information

United States (USA): All components of this product are included on the TSCA Chemical Inventory or are not required to be listed on the TSCA Chemical Inventory.

Canada: All components of this product are included on the Domestic Substances List (DSL) or are not required to be listed on the DSL.

European Economic Area (including EU): When purchased from a Cytec legal entity based in the EU, this product is compliant with the registration of the REACH Regulation (EC) No. 1907/2006 as all its components are either excluded, exempt, pre-registered and/or registered.

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

China: All components of this product are included on the Chinese inventory or are not required to be listed on the Chinese inventory.

Japan: All components of this product are included on the Japanese (ENCS) inventory or are not required to be listed on the Japanese inventory.

Korea: All components of this product are included on the Korean (ECL) inventory or are not required to be listed on the Korean inventory.

Philippines: All components of this product are included on the Philippine (PICCS) inventory or are not required to be listed on the Philippine inventory.

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

FIFRA INFORMATION

This chemical is a pesticide product registered by the United States Environmental Protection Agency (EPA) and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals. The hazard information required on the pesticide label is reproduced below. The pesticide label also includes other important information, including directions for use.

EPA Registration Number: 68387-7

DANGER - POISON (Skull and crossbones)

Restricted Use Pesticide (due to high acute inhalation toxicity of phosphine gas)

KEEP OUT OF REACH OF CHILDREN

Fatal if inhaled. The liquid may cause burns. This product is highly toxic to fish and wildlife. Phosphine gas may deaden the sense of smell. Phosphine may ignite spontaneously at levels above its lower flammability limit of 1.8% v/v (18,000 ppm). Ignition of high concentration of phosphine can produce an explosive reaction.

PRODUCT HAZARD CLASSIFICATION UNDER SECTION 311 OF SARA

- Acute
 - Pressure generating
-

16. OTHER INFORMATION**NFPA Hazard Rating (National Fire Protection Association)**

Health: 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

Fire: 0 - Materials that will not burn.

Instability: 1 - Materials that in themselves are normally stable, but that can become unstable at elevated temperatures and pressures.

Reasons For Issue: Revised Section 1

Date Prepared: 02/05/2017

Date of last significant revision: 02/01/2017

Component Hazard Phrases

Carbon dioxide

H332 - Harmful if inhaled.

Phosphine

H220 - Extremely flammable gas.

H314 - Causes severe skin burns and eye damage.

H330 - Fatal if inhaled.

H400 - Very toxic to aquatic life.

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