MATERIAL SAFETY DATA SHEET

Product Name: **MAGNAPHOS® GAS BAGS**

Version: 1 Date issued: 1/24/2004

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Company: United Phosphorus, Inc.
423 Riverview Plaza
Trenton, NJ 08611

Product Information: (609) 392-8200 or www.upi-usa.com

Product Name: **MAGNAPHOS® Gas Bags**

Product use: Fumigant

FOR CHEMICAL EMERGENCY: Spill, leak, fire, exposure, or accident, call CHEMTREC 1-800-424-9300

AN APPROVED APPLICATOR'S MANUAL ACCOMPANIES THE PRODUCT. REFER TO THE APPLICATOR'S MANUAL FOR DETAILED PRECAUTIONS, RECOMMENDATIONS AND DIRECTIONS FOR USE.

Magnaphos is a Registered Trade Mark of United Phosphorus, Inc.

SECTION 2 COMPOSITION/INFORMATION ON INGREDIENTS

MAGNAPHOS Gas bags contain magnesium phosphide, a metal phosphide, which reacts with water to produce phosphine gas (PH_3; hydrogen phosphide) as shown in the following equation:

$$Mg_3P_2 + 6H_2O \rightarrow 3Mg(OH)_2 + 2PH_3$$

Identity	CAS #	Typical %
Magnesium Phosphide [Mg_3P_2]	12057-74-8	66%
Other Ingredients:	---	34%
Phosphine [PH_3]	7803-51-2	
Magnesium hydroxide [$Mg(OH)_2$]	1309-42-8	

MAGNAPHOS is formulated with 66% magnesium phosphide and also contains ammonium carbamate and inert ingredients. Ammonium carbamate releases ammonia and carbon dioxide as show in the following equation:

$$NH_2COONH_4 \rightarrow 2NH_3 + CO_2$$

Identity	CAS #
Ammonium carbonate [NH_2COONH_4]	1111-78-0
Ammonia [NH_3]	7664-41-7
Carbon dioxide [CO_2]	124-38-9

SECTION 3 HAZARDS IDENTIFICATION

PHYSICAL HAZARDS: Dangerous when wet

HEALTH HAZARDS: Poison

PRIMARY ROUTE(S) OF ENTRY: Inhalation, Ingestion

NFPA RATING

Health Hazard	4
Flammability Hazard	4
Reactivity Hazard	2
Special Hazard	W (Dangerous when Wet)

Read the entire MSDS for a more thorough evaluation of hazards.

SECTION 4 FIRST AID MEASURES

DANGER: MAGNAPHOS® Gas Bags or dust can be fatal if swallowed. Do not get in eyes, on skin, or on clothing. Do not eat, drink or smoke while handling magnesium phosphide fumigants. When a sealed container is opened, allowing material to come in contact with moisture, water or acids, toxic phosphine gas will be released. Pure phosphine gas is odorless but a garlic odor may be detected due to a contaminant. Since an odor may not be detected under certain circumstances, the absence of a garlic odor does not mean that phosphine gas is absent.
Symptoms of exposure to this product are headaches, dizziness, nausea, difficult breathing, vomiting, and diarrhea. In all cases of overexposure get medical attention immediately. Take victim to a doctor or emergency treatment facility. For emergency medical treatment, contact the National Pesticide Information Center at 1-800-858-7378.

IF INHALED:

- Move person to fresh air.

- If person is not breathing, call 911 or an ambulance, then begin artificial respiration immediately, preferably by mouth-to-mouth.
- Keep warm and make sure person can breathe freely.
- Contact a poison control center or doctor for treatment advice.

IF SWALLOWED:

- Call a Poison control center or doctor immediately for treatment advice.
- Have person drink one or two glasses of water and induce vomiting by touching back of throat with finger, or if available administer syrup of ipecac.
- Do not give anything by mouth to an unconscious person.

IF ON SKIN OR CLOTHING:

- Brush or shake material off clothes and shoes in a well-ventilated area.
- Allow clothes to aerate in a ventilated area prior to laundering.
- Do not leave contaminated clothing in occupied and/or confined areas such as automobiles, vans, motel rooms, etc.
- Wash contaminated skin thoroughly with soap and water.

IF IN EYES:

- Hold eye open and rinse slowly and gently with water for 15 - 20 minutes.
- Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a poison control center or doctor for treatment advice.

Note to Physician: Magnesium phosphide in MAGNAPHOS Tablets reacts with moisture from the air, water, acids and many other liquids to release hydrogen phosphide (phosphine) gas. Mild exposure by inhalation causes malaise (indefinite feeling of sickness), ringing of ears, fatigue, nausea, and pressure in the chest, which is relieved by removal to fresh air. Moderate poisoning causes weakness, vomiting, pain just above the stomach, chest pain, diarrhea and dyspnea (difficulty in breathing). Symptoms of severe poisoning may occur within a few hours to several days, resulting in pulmonary edema (fluid in lungs) and may lead to dizziness, cyanosis (blue or purple skin color), unconsciousness, and death.

SECTION 5 FIRE FIGHTING MEASURES

FLASH POINT:	Magnesium phosphide and MAGNAPHOS themselves are not flammable. However, they react readily with water to produce phosphine gas (PH_3, hydrogen phosphide) which may ignite spontaneously at air concentrations above the LEL of 1.8% v/v.
FLAMMABLE LIMITS (STP):	Lower, 1.8% v/v. The UEL of phosphine gas is not known.
EXTINGUISHING MEDIA:	Suffocate flames with sand, carbon dioxide or dry extinguishing materials. Ventilate the area to reduce the concentration below flammable limits.
SPECIAL FIRE-FIGHTING PROCEDURES:	DO NOT USE WATER ON METAL PHOSPHIDE FIRES.
PROTECTIVE EQUIPMENT:	Wear a NIOSH/MSHA-approved self-contained breathing apparatus (SCBA) or equivalent respiratory protection. Wear gloves when handling MAGNAPHOS Gas Bags.
UNUSUAL FIRE AND EXPLOSION HAZARDS:	Phosphine (hydrogen phosphide)-air mixtures at concentrations above the lower flammable limit of 1.8% v/v may ignite spontaneously. Ignition of high concentrations of phosphine gas can produce a very energetic reaction. Explosions can occur under these conditions and may cause personal injury. **Never allow the buildup of hydrogen phosphide to exceed explosive concentrations.** Do not confine spent or partially spent dust from metal phosphide fumigants since the slow release of phosphine gas from these materials may result in formation of an explosive atmosphere. Spontaneous ignition may occur if large quantities of magnesium phosphide are piled in contact with liquid water. This is particularly true if quantities of these materials are placed in moist or spoiled grain which can provide partial confinement of the phosphine gas liberated by hydrolysis. Fires containing phosphine or metal phosphides will produce phosphoric acid by the following reaction: $2PH_3 + 4O_2 \rightarrow 3H_2O + P_2O_5 \rightarrow 2H_3PO_4$

SECTION 6 ACCIDENTAL RELEASE MEASURES

Steps to be taken in case material is released or spilled: A spill, other than incidental to application or

normal handling, may produce high levels of gas. For Personal Protection, a NIOSH/MSHA approved full-face gas mask – hydrogen phosphide canister combination (if exposed to levels up to 15 ppm) or a Self Contained Breathing Apparatus (SCBA) (if exposure is unknown or above 15 ppm) must be worn during wet deactivation of partially spent material. Wear dry cotton or other gloves when handling powder from broken bags.

METHODS FOR CLEAN UP:

Do not use water at any time to clean up a spill of MAGNAPHOS® Gas Bags. Water in contact with unreacted MAGNAPHOS® Gas Bags will greatly accelerate the production of hydrogen phosphide gas which could result in a toxic and/or fire hazard. Wear gloves of cotton or other material when handling magnesium phosphide.

Freshly spilled material which has not been contaminated by water or foreign matter may be replaced into original containers. If the aluminum flasks have been punctured or damaged so as to leak, the container may be temporarily repaired with aluminum tape or the MAGNAPHOS® Gas Bags may be transferred from the damaged flask to a sound metal container which should be sealed and properly labeled as magnesium phosphide. Transport the damaged containers to an area suitable for pesticide storage for inspection.

If the age of the spill is unknown or if the product has been contaminated with soil, debris, water, etc., gather up the spillage in small open buckets having a capacity no larger than about 1 gallon. Do not add more than about 0.5 kg (1 lb.) to a bucket. If on-site deactivation is not feasible, transport the uncovered buckets in open vehicles to a suitable area. Respiratory protection will most likely be required during cleanup of spilled magnesium phosphide fumigants (see Personal Protection, above) if the concentration of phosphine is unknown. Small amounts of spillage, from about 2 to 4 kg (4 to 9 lbs) may be spread out over the ground in an open areas to be deactivated by atmospheric moisture. Alternatively, spilled magnesium phosphide fumigants may be deactivated by the Wet Method as described in Section 13, Disposal Considerations.

For large spills or chemical emergency: spill, leak, fire, exposure or accident, call CHEMTREC, day or night, at 1-800-424-9300.

SECTION 7 HANDLING AND STORAGE

REQUIREMENTS FOR STORAGE ROOMS:

Containers should be stored in a cool, dry, well-ventilated area away from heat, under lock and key. Post as a pesticide storage area. Exercise due caution to prevent damage to or leakage from the container.

ADDITIONAL INFORMATION:

Do not contaminate water, food or feed by storage or disposal. Do not allow water or other liquids to contact magnesium phosphide products. Do not store in buildings where humans or domestic animals reside. Keep out of reach of children. MAGNAPHOS® Gas Bags are supplied in gas-tight, resealable aluminum flasks. Do not pile up large quantities of magnesium phosphide during fumigation or disposal. It is recommended that magnesium phosphide products are opened in open air or near a fan, which exhausts outside immediately. Never open in flammable atmosphere because on rare occasions it may flash. When opening, point the container away from the face and body. These precautions will also reduce the applicators exposure to hydrogen phosphide (phosphine) gas. Do not expose the product to atmospheric moisture any longer than is necessary and seal tightly before returning flasks to storage.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational (inhalation) exposure limits

	OSHA PEL	ACGIH TLV	
	TWA (ppm)	TWA, (ppm)	STEL (ppm)
Phosphine (PH_3, hydrogen phosphide)*	0.3	0.3	1.0
Ammonia	50	25	35
Carbon Dioxide	5,000	5,000	30,000

***EPA limits are** 0.3 ppm TWA during fumigation and 0.3 ppm ceiling at all other times.

RESPIRATORY PROTECTION:

A NIOSH/MSHA-approved full face mask with approved canister for phosphine (PH_3, hydrogen phosphide) may be worn at concentrations up to 15 ppm. At levels above this or when the hydrogen phosphide concentration is unknown, NIOSH/MSHA-approved SCBA or equivalent must be worn.

PROTECTIVE CLOTHING:

This product is FIFRA regulated. Refer to product labeling and Applicator Manual for end-user Personal Protection requirements. Skin contact should be prevented through the use of dry cotton gloves or other material if contact with powdered formulation is likely. Remove contaminated clothing and wash before rewearing. Wash separately from other laundry.

EYE PROTECTION:

None required. However, eye contact with the material should be avoided through the use of chemical safety glasses, goggles or a faceshield, selected in regard to exposure potential.

VENTILATION:

Local ventilation is generally adequate to reduce hydrogen phosphide levels in fumigated areas to below the TWA. Exhaust fans may be used to speed the aeration of silos, warehouses, shipholds, containers, etc.

WORK/HYGIENE PRACTICES:

Do not breathe dust. Do not get in eyes or on hands, skin or clothing. Do not eat, drink or smoke white handling. Wash hands thoroughly with soap and water after handling. An OSHA-respiratory protective program should be instituted. An SCBA must be available during application from within the site being fumigated but needn't be on the premises. However, some type of NIOSH/MSHA approved respiratory protection must be immediately available. Worker exposure must be adequately characterized initially and followed by occasional monitoring. OSHA recommends that the exposure screening of employees be conducted to detect impaired pulmonary function and that any employees developing the above conditions be referred for medical attention.

Other protective equipment:

Equipment for detection of phosphine should be used. An adequate supply of clean potable water should be available to allow thorough flushing of skin and eyes in event of contact with this compound.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Magnesium phosphide in MAGNAPHOS® Gas Bags and partially spent dust will release hydrogen phosphide if exposed to moisture from the air or if it comes into contact with water, acids and many other liquids. Piling of MAGNAPHOS® Gas Bags or dust from their fragmentation may cause a temperature increase and confine the release of gas so that ignition could occur.

Pure hydrogen phosphide (phosphine) gas is practically insoluble in water, fats and oils, and is stable at normal fumigation temperatures. However, it may react with certain metals and cause corrosion, especially at higher temperatures and relative humidities. Metals such as copper, brass, and other copper alloys, and precious metals such as gold and silver are susceptible to corrosion by phosphine. Thus items such as small electric motors or detectors, brass sprinkler heads, batteries and battery chargers, fork lifts, temperature monitoring systems, electrical switchgear, communication devices, computers, calculators, watches, and other electronic equipment may be damaged by this gas. Hydrogen phosphide will also react with certain metallic salts and, therefore such items as photographic film, copying papers and some inorganic pigments, etc. should not be exposed.

Form:	Magnesium phosphide, solid (produces phosphine gas)
Color:	gray-green (phosphine gas is colorless)
Odor:	Phosphine gas has an odor described as similar to carbide, garlic, or decaying fish.
Vapor Pressure:	Magnesium phosphide 0 mm Hg; Phosphine gas 40 mm Hg (-129.4°C)
Boiling Point:	Magnesium phosphide >1000°C; Phosphine gas -87.7°C
Melting Point:	Phosphine gas -133.5°C
Specific gravity of Vapors:	Magnesium phosphide N/A; Phosphine gas 1.17 (air = 1)
Specific gravity:	Magnesium phosphide 2.06
Water Solubility:	Magnesium phosphide - insoluble and reacts; Phosphine gas - slightly soluble (26 ml/100 mL, 17°C)

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Magnesium phosphide is stable to most chemical reactions, except for hydrolysis. MAGNAPHOS will react with moist air, liquid water, acids and some other liquids to produce toxic and flammable phosphine gas.

INCOMPATIBILITY: Avoid contact with water and oxidizing agents.

CORROSION: Phosphine gas may react with certain metals (gold, silver, copper, brass, other precious metals and their alloys) and cause corrosion especially at higher temperatures and relative humidities. See additional comments in Section 9, Physical and Chemical Properties.

HAZARDOUS POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: Phosphine gas, phosphoric acid, phosphorus pentoxide.

SECTION 11 TOXICOLOGICAL INFORMATION

The dermal toxicity of magnesium phosphide is very low with an LD_{50} > 5,000 mg/kg body weight for a 1-hour exposure. Magnesium phosphide is a highly toxic via the oral rout with an acute oral LD_{50} of 9.1 mg/kg body weight. Phosphine gas is acutely toxic based on an acute inhalation LC_{50} of 190 ppm for a 1-hour exposure. Magnesium phosphide and phosphine gas are not known to cause chronic toxicity.

EFFECTS OF OVER-EXPOSURE: Symptoms of exposure to this product are headaches, dizziness, nausea, difficult breathing, vomiting, and diarrhea. Mild exposure by inhalation causes malaise (indefinite feeling of sickness), ringing of ears, fatigue, nausea, and pressure in the chest, which is relieved by removal to fresh air. Moderate poisoning causes weakness, vomiting, pain just above the stomach, chest pain, diarrhea and dyspnea (difficulty in breathing). Symptoms of severe poisoning may occur within a few hours to several days, resulting in pulmonary edema (fluid in lungs) and may lead to dizziness, cyanosis (blue or purple skin color), unconsciousness, and death.

CARCINOGENICITY: Not listed by NTP, IARC or OSHA.

SECTION 12 ECOLOGICAL INFORMATION

This product is very highly toxic to wildlife. Many non-target organisms exposed to phosphine gas in burrows will be killed. Do not apply directly to water or wetlands (swamps, bogs, marshes, and potholes). Do not contaminate water by cleaning of equipment or disposal of wastes.

SECTION 13 DISPOSAL CONSIDERATIONS

DISPOSAL METHOD – MAGNAPHOS Gas Bags: When being disposed of, spilled or partially reacted magnesium phosphide fumigants are considered hazardous wastes under existing Federal Regulations. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance. Some local and state waste disposal regulations may vary therefore disposal procedures must be reviewed with appropriate authorities to ensure compliance with these regulations. Contact your state Pesticide or Environmental Control Agency or Hazardous Waste guidance.

If properly exposed, the grayish-white residual dust from MAGNAPHOS Gas Bags will not be a hazardous waste under RCRA, 40CFR 261 and normally contain only a very small amount of unreacted magnesium phosphide. This waste will be safe for disposal. Properly exposed material is not a hazardous waste. However, the residuals from incompletely exposed magnesium phosphide fumigants may require special care. See Deactivation of Partially Spent Gas Bags, below.

Wet Deactivation Method of Partially Spent or Spilled MAGNAPHOS Gas Bags:
MAGNAPHOS Gas Bags and residual dust from phosphine fumigations may be deactivated with water using the "wet" deactivation method as follows:

1. Fill the container in which the deactivation is to be performed with water to within a few inches of the top.
2. The spilled material or partially spent gas bags are slowly added to the water. Intact gas bags are submerged in the water. MAGNAPHOS Gas Bags may ignite during wet deactivation if they are allowed to float to the surface. A metal grid works well to keep gas bags submerged. Do not cover the container. This deactivation should be done in the open air. Use no less than 1 gallon of water solution for 60 gas bags. Wear appropriate respiratory protection during wet deactivation of partially spent gas bags.

Note: Partially spent Gas Bags may react quite violently during this "wet" deactivation if they were exposed under cold and/or dry conditions or if the fumigation period was shortened. Test a small portion of product prior to immersing

large amounts of material in the water if it is suspected that the product contains considerable unreacted magnesium phosphide.

3. Allow the mixture to stand, with occasional stirring for about 6 hours. The mixture will then be safe for disposal.
4. Dispose of the deactivated material, with or without preliminary decanting, at a sanitary landfill or other suitable site approved by local authorities. Where permissible, the deactivation water containing spent dust may be poured into a storm sewer or out onto the ground.

CONTAINER DISPOSAL: Bags containing spent magnesium phosphide may be collected and disposed in a sanitary landfill, incinerator or other approved sites or by other procedures approved by federal, state or local authorities. Since the flasks used to package these products are not contacted by metal phosphides, they are not required to be triple-rinsed or deactivated. Empty flasks may be offered for recycling or reconditioning, or punctured and disposed of in a sanitary landfill, or by other procedures approved by state and local authorities.

SECTION 14 TRANSPORT INFORMATION

DOT SHIPPING DESCRIPTION: Magnesium phosphide mixture, 4.3, UN 2011, PG I, dangerous when wet, poison.
DOT PLACARDING: Dangerous when wet (any quantity)

SECTION 15 REGULATORY INFORMATION

SARA: Section 302 –magnesium phosphide (Mg_3P_2) is listed as an extremely hazardous substance. The threshold planning quantity is 500 lbs- Mg_3P_2 (226.8 kg) i.e. 11,136 bags contain 500 lbs of Mg_3P_2.

OSHA HAZARD COMMUNICATION HAZARDS:
Immediate health hazard (highly toxic), reactivity, fire

CERCLA REPORTABLE QUANTITY:
Spill of 100 lbs (45 kg) magnesium phosphide 2,227 bags contain 100 lbs Mg_3P_2.

SECTION 16 OTHER INFORMATION

ABBREVIATIONS

TWA = Time Weighted Average
TLV = Threshold Limit Value
OSHA = Occupational Safety and Health Administration
STEL = Short Term Exposure Limit
PEL = Permissible Exposure Limit
ACGIH = American Conference of Governmental Industrial Hygienists

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