DEGESCH AMERICA, INC.

MATERIAL SAFETY DATA SHEET: ALUMINUM PHOSPHIDE, PHOSTOXIN®

PROPER DOT SHIPPING NAME: ALUMINUM PHOSPHIDE, 4.3 UN1397 PG I DANGEROUS WHEN WET, POISON LABELS APPLY

SECTION I - PRODUCT INFORMATION

Manufacturer:

DEGESCH America, Inc.
275 Triangle Dr.
P. O. Box 116
Weyers Cave, VA 24486 USA

Telephone: (540) 234-9281
Telefax: (540) 234-8225
Internet Address:
http://www.degeschamerica.com

EMERGENCY TELEPHONE NOS.:

Emergency - Chemtrec (800) 424-9300
Emergency and Information - DEGESCH America, Inc. (540) 234-9281

Phostoxin is available as 0.6g pellets and 3.0g tablets. Tabletized Phostoxin is also available in gas permeable packages called Prepacs and Ropes. Products are packed in gas-tight containers.

Date of Revision: March 1999

SECTION II - HAZARDOUS INGREDIENTS INFORMATION

Identity:

Phostoxin, Aluminum Phosphide, AlP - reacts with water to produce phosphine, hydrogen phosphide, PH_3 as shown in Equation 1. Phostoxin is formulated with 55% aluminum phosphide and also contains ammonium carbamate and inert ingredients. Ammonium carbamate releases ammonia and carbon dioxide as shown in Equation 2.

1) $AlP + 3H_2O \rightarrow Al(OH)_3 + PH_3$

AlP CAS No. 20859-73-8

PH_3 CAS No. 7803-51-2

2) $NH_2COONH_4 \rightarrow 2NH_3 + CO_2$

NH_2COONH_4 CAS No. 1111-78-0

NH_3 CAS No. 7664-41-7

CO_2 CAS No. 124-38-9

NFPA Chemical Hazard Ratings:
Flammability Hazard 4
Health Hazard 4
Reactivity Hazard 2
Special Hazard ~~W~~

SARA Physical and Health Hazards:
Fire
Reactivity
Immediate (Acute)

Inhalation Exposure Limits:

Component	OSHA PEL TWA (ppm)	ACGIH TLV TWA (ppm)	ACGIH TLV STEL (ppm)	NIOSH IDLH (ppm)
Hydrogen Phosphide*	0.3	0.3	1.0	50
Ammonia	50	25	35	300
Carbon Dioxide	5,000	5,000	30,000	40,000

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

SECTION III - PHYSICAL CHARACTERISTICS

Boiling Point:
AlP >1000°C
PH_3 -87.7°C

Specific Gravity of Vapors (Air = 1):
AlP N/A
PH_3 1.17

Vapor Pressure:
AlP 0mm Hg
PH_3 40mm Hg @-129.4°C

Solubility in Water:
AlP Insoluble, reacts
PH_3 26cc in 100 ml water at 17°C

Appearance and Odor:

Phostoxin and aluminum phosphide have a greenish-gray color and the hydrogen phosphide (phosphine, PH_3) gas produced by these chemicals has an odor described as similar to garlic, carbide or decaying fish.

Specific Gravity:
AlP 2.85

Melting Point:
AlP >1000°C
PH_3 -133.5°C

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point:

Aluminum phosphide and Phostoxin are not themselves flammable. However, they react readily with water to produce hydrogen phosphide (phosphine, PH_3) gas which may ignite spontaneously in air at concentrations above its LEL of 1.8% v/v. UEL of hydrogen phosphide is not known.

Extinguishing Media:

Suffocate flames with sand, carbon dioxide or dry extinguishing chemicals.

Special Fire Fighting Procedures:

Do not use water on metal phosphide fires.

Respiratory Protection:

Wear NIOSH/MSHA approved SCBA or equivalent respiratory protection.

Protective Clothing:

Wear gloves when handling Phostoxin tablets, pellets or dust.

Unusual Fire and Explosion Hazards:

Hydrogen phosphide-air mixtures at concentrations above the lower flammable limit of 1.8% v/v, PH_3 may ignite spontaneously. Ignition of high concentrations of hydrogen phosphide can produce a very energetic reaction. Explosions can occur under these conditions and may cause severe personal injury. Never allow the buildup of hydrogen phosphide to exceed explosive concentrations. Open containers of metal phosphides in open air only and never in a flammable atmosphere. Do not confine spent or partially spent dust from metal phosphide fumigants as the slow release of hydrogen phosphide from these materials may result in the formation of an explosive atmosphere. Spontaneous ignition may occur if large quantities of aluminum phosphide or 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 hydrogen phosphide gas liberated by hydrolysis.

Fires containing hydrogen phosphide or metal phosphides will produce phosphoric acid by the following reaction:

$$2PH_3 + 4O_2 \text{ ---> } 3H_2O = P_2O_5 \text{ ---> } 2H_3PO_4$$

SECTION V - REACTIVITY DATA

Stability:

Phostoxin and aluminum phosphide are stable to most chemical reactions, except for hydrolysis. They will react with moist air, liquid water, acids and some other liquids to produce toxic and flammable hydrogen phosphide gas. Hydrogen phosphide may react vigorously with oxygen and other oxidizing agents.

Incompatibility:

Avoid contact with water and oxidizing agents.

Corrosion:

Hydrogen phosphide gas 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. Small electric motors, smoke detectors, brass sprinkler heads, batteries and battery chargers, fork lifts, temperature monitoring systems, switching gears, communication devices, computers, calculators and other electrical equipment may be damaged by this gas. Hydrogen phosphide will also react with certain metallic salts and, therefore, sensitive items such as photographic film, some inorganic pigments, etc., should not be exposed.

Hazardous Polymerization:

Will not occur.

SECTION VI - HEALTH HAZARD INFORMATION

Routes of Entry:

The dermal toxicity of aluminum phosphide is very low. The LD_{50} via the dermal route is greater than 5,000 mg per kilogram for a 1-hour exposure. Primary routes of exposure are inhalation and ingestion.

Acute and Chronic Health Hazards:

Phostoxin is a highly acute toxic substance. The LC_{50} for hydrogen phosphide gas is about 190 ppm for a one-hour inhalation exposure. The acute oral toxicity of the Phostoxin formulation was found to be 11.5 mg/kg of body weight. Phostoxin is not known to cause chronic poisoning.

Carcinogenicity:

Phostoxin is not known to be carcinogenic and is not listed as such by NTP, IARC or OSHA.

Signs and Symptoms of Exposure:

Aluminum phosphide tablets, pellets and dust react with moisture from the air, acids and many other liquids to release hydrogen phosphide (phosphine, PH_3) gas. Mild exposure by inhalation causes malaise (indefinite feeling of sickness), ringing in the ears, fatigue, nausea and pressure in the chest which is relieved by removal to fresh air. Moderate poisoning causes weakness, vomiting, pain just about 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.

Emergency and First Aid Procedures:

Symptoms of overexposure are headache, 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.

If the gas or dust from aluminum phosphide is inhaled:
Get exposed person to fresh air. Keep warm and make sure person can breathe freely. If breathing has stopped, give artificial respiration by mouth-to-mouth or other means of resuscitation. Do not give anything by mouth to an unconscious person.

If aluminum phosphide pellets, tablets or powder are swallowed:
Drink or administer one or two glasses of water and induce vomiting by touching back of throat with finger, or if available, syrup of ipecac. Do not give anything by mouth if victim is unconscious or not alert.

If powder or granules of aluminum phosphide get on skin or clothing:
Brush or shake material off clothes 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 dust from pellets or tablets gets in eyes:
Flush with plenty of water. Get medical attention.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING

Spill Cleanup Procedures:

If possible, dispose of spilled Phostoxin by use according to label instructions. Freshly spilled material which has not been contaminated by water or foreign matter may be replaced into original containers. Punctured flasks or containers may be temporarily repaired using aluminum tape. If the age of the spill is unknown or if the Phostoxin 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 1 to 1.5kg (2 to 3 lbs.) to a bucket. If on-site wet deactivation is not feasible, transport the uncovered buckets in open vehicles to a suitable area. Wear gloves when handling Phostoxin.

Respiratory protection may be required during cleanup of spilled material. If the concentration of hydrogen phosphide is unknown, NIOSH/MSHA approved SCBA or its equivalent must be worn.

Small amounts of spillage, from about 4 to 8 kg (9 to 18 lbs.) may be spread out over the ground in an open area to be deactivated by atmospheric moisture. Alternatively, spilled Phostoxin may be deactivated by the wet method as described in the following.

Wet Deactivation of Spilled Phostoxin:

1. Deactivating solution is prepared by adding the appropriate amount of low sudsing detergent to water in a drum or other suitable container. A 2% solution or 4 cups of detergent in 30 gallons is suggested. The container should be filled with deactivating solution to within a few inches of the top.

2. The material is added slowly to the deactivating solution and stirred so as to thoroughly wet all of the Phostoxin. This should be carried out in open air and respiratory protection may be required. At no time should the deactivation drum be covered.

3. No more than about 45 to 50 lbs. of Phostoxin should be added to 15 gallons of water-detergent mixture. Prepacs and Ropes may ignite during wet deactivation if they are allowed to float to the surface. Add weights or otherwise ensure that Prepacs and Ropes stay submerged until deactivation is completed.

4. Allow the mixture to stand, with occasional stirring, for about 36 hours. The resultant slurry will then be safe for disposal.

5. Dispose of the slurry of deactivated material, with or without preliminary decanting, at a sanitary landfill or other suitable site approved by local authorities. Where permissible, this slurry may be poured into a storm sewer or out onto the ground.

For Assistance:

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or

Chemtrec: (800) 424-9300

Disposal of Spent Phostoxin:

When being disposed of, spilled or partially reacted Phostoxin is considered a hazardous waste under existing Federal Regulations. If properly exposed, the grayish-white residual dust after a fumigation will not be a hazardous waste and normally contains only a very small amount of unreacted aluminum phosphide. This waste will be safe for disposal. However, the spent residual dust from incompletely exposed Phostoxin may require special care.

Triple rinse flasks and stoppers with water. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities. Rinsate may be disposed of in a storm sewer, sanitary landfill or by other approved procedures. Or, it is permissible to remove lids and expose empty flasks to atmospheric conditions until the residue in the flasks is reacted. Then puncture and dispose of in a sanitary landfill or other approved site, or by other procedures approved by state and local authorities.

Some local and state waste disposal regulations may vary from the following recommendations. Disposal procedures should be reviewed with appropriate authorities to ensure compliance with local regulations. Contact your State Pesticide or Environmental Control Agency or Hazardous Waste

Specialist at the nearest EPA Regional Office for guidance.

1. Confinement of partially spent residual dust, as in a closed container, or collection and storage of large quantities of dust may result in a fire or explosion hazard. Small amounts of hydrogen phosphide may be given off from unreacted aluminum phosphide, and confinement of the gas may result in a flash.

2. In open areas, small amounts of spent residual dust may be disposed of on site by burial or by spreading over the land surface away from inhabited buildings.

3. Residual dust from Phostoxin may also be collected and disposed of at a sanitary landfill, incinerator or other approved sites or by other procedures approved by Federal, State or Local authorities.

4. From 2 to 3 kg (4 to 7 lbs.) of spent dust from 2 to 3 flasks of Phostoxin may be collected for disposal in a 1-gallon bucket. Larger amounts, up to about one-half case, may be collected in burlap, cotton or other types of porous cloth bags for transportation in an open vehicle to the disposal site. Do not collect dust from more than 7 flasks of tablets or 10 flasks of pellets (about 11 kg or 25 lbs.) in a single bag. Do not pile cloth bags together. Do not use this method for partially spent or "green" dust. **Caution:** Do not collect dust in large drum, dumpsters, plastic bags or other containers where confinement may occur.

Deactivation of Partially Spent Phostoxin Prepacs and Ropes:

Phostoxin Prepacs and Ropes which are only partially spent may be rendered inactive by either a "dry" or "wet" deactivation method. The "dry" method entails holding the Prepacs and Ropes out of doors in locked, 30-gallon wire baskets which are available from DEGESCH America, Inc., or your supplier. Protect the partially spent Phostoxin from rain. The deactivated Prepacs and Ropes may then be taken to an approved site for incineration or burial at periodic intervals or whenever the wire container is full. **Caution:** Storage of partially spent Prepacs and Ropes in closed containers may result in a fire hazard.

Alternatively, partially spent Prepacs and Ropes and residual dust from Phostoxin fumigation may be treated by the "wet" deactivation method as follows:

1. Deactivating solution is prepared by adding the appropriate amount of low sudsing detergent or surface active agent to water in a drum or other suitable container. A 2% solution or 4 cups of detergent in 30 gallons is suggested. The container should be filled with deactivating solution to within a few inches of the top.

2. Immerse spent Prepacs and Ropes or slowly pour residual dust into the deactivating solution while stirring so as to thoroughly wet all of the spent Phostoxin. This should be done in the open air and not in the fumigated structure. Dust from Phostoxin tablets or pellets should be mixed into no less than about 10 gallons of water-detergent solution for each case of spent material.

3. Dispose of the deactivated Prepacs and Ropes or dust-water suspension, with or without preliminary decanting, at a sanitary landfill or other suitable site approved by local authorities. Where permissible, the slurry may be poured into a storm sewer or out onto the ground.

4. **Caution:** Respiratory protection may be required during wet deactivation. Do not cover the container at any time. Do not dispose of dust in a toilet. Do not allow quantities of dry, spent dust from Phostoxin to be collected or stored without deactivation.

Precautions to be Taken in Handling and Storage:

Store Phostoxin products in a locked, dry, well-ventilated area away from heat. Post as a pesticide storage area. Do not store in buildings inhabited by humans or domestic animals.

Other Precautions:

1. Do not allow water or other liquids to contact Phostoxin.
2. Do not pile up large quantities of Phostoxin during fumigation or disposal.
3. Once exposed, do not confine Phostoxin or otherwise allow hydrogen phosphide concentration to exceed the LEL.
4. Open containers of Phostoxin only in open air. Do not open in a flammable atmosphere. Hydrogen phosphide in the head space of containers may flash upon exposure to atmospheric oxygen.
5. Phostoxin is a restricted use pesticide due to acute inhalation toxicity of highly toxic hydrogen phosphide (phosphine, PH_3) gas. For retail sale to and use only by certified applicators or persons under their direct supervision and only for those uses covered by the certified applicator's certification.
6. See EPA approved labeling for additional precautions and directions for use.

SECTION VIII - CONTROL MEASURES

Respiratory Protection:

NIOSH/MSHA approved full-face mask with approved canister for phosphine (hydrogen phosphide, PH_3) 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:

Wear gloves when handling aluminum phosphide tablets, pellets or dust.

Eye Protection:

None required.

Ventilation:

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

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