MATERIAL SAFETY DATA SHEET:
MAGNESIUM PHOSPHIDE – MAGTOXIN®, DEGESCH-PLATES®, DEGESCH-STRIPS®

SECTION I

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Date of Revision: April, 2014

SECTION II – HAZARDOUS INGREDIENTS INFORMATION

Identity:
Magtoxin, Degesch Plates, Magnesium Phosphide, Mg₃P₂-Reacts with water to produce Phosphine, Hydrogen Phosphide, PH₃:

\[ \text{Mg}_3\text{P}_2 + 6\text{H}_2\text{O} \rightarrow 3\text{Mg(OH)}_2 + 2\text{PH}_3 \]

\[ \begin{align*}
\text{Mg}_3\text{P}_2 & \quad \text{CAS No. 12057-74-8} \\
\text{PH}_3 & \quad \text{CAS No. 7803-51-2}
\end{align*} \]

Magtoxin is formulated with 66% magnesium phosphide and also contains ammonium carbamate and inert ingredients. Ammonium carbamate releases ammonia and carbon dioxide as follows:

\[ \text{NH}_2\text{COONH}_4 \rightarrow 2\text{NH}_3 + \text{CO}_2 \]

\[ \begin{align*}
\text{NH}_2\text{COONH}_4 & \quad \text{CAS No. 1111-78-0} \\
\text{NH}_3 & \quad \text{CAS No. 7664-41-7} \\
\text{CO}_2 & \quad \text{CAS No. 124-38-9}
\end{align*} \]

Magtoxin is available as 0.6g pellets and 3.0g tablets. Products are packed in gas-tight containers.

Plates are produced by impregnating magnesium phosphide into polyethylene in the form of a 117g plate, each plate containing 33g of hydrogen phosphide. The Degesch Strip is formed by attaching together, end-to-end, 20 of the Degesch plates. Degesch Plates and Degesch Strips do not liberate carbon dioxide and ammonia.

Inhalation Exposure Limits:

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>OSHA PEL</th>
<th>ACGIH TLV</th>
<th>ACGIH TLV</th>
<th>IDLH</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(ppm)</td>
<td>TWA</td>
<td>STEL</td>
<td></td>
</tr>
<tr>
<td>Hydrogen Phosphide</td>
<td>0.3</td>
<td>0.3</td>
<td>1.0</td>
<td>200</td>
</tr>
<tr>
<td>Ammonia</td>
<td>50</td>
<td>25</td>
<td>35</td>
<td>500</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>5000</td>
<td>5000</td>
<td>30,000</td>
<td>50,000</td>
</tr>
</tbody>
</table>
SECTION III – PHYSICAL CHARACTERISTICS

Boiling Point:
- \( \text{Mg}_3\text{P}_2 \): > 1000°C
- \( \text{PH}_3 \): -87.7°C

Specific Gravity of Vapours (Air=1):
- \( \text{Mg}_3\text{P}_2 \): N/A
- \( \text{PH}_3 \): 1.17

Vapour Pressure:
- \( \text{Mg}_3\text{P}_2 \): Omm Hg
- \( \text{PH}_3 \): 40mm Hg at -129.4°C

Solubility in Water:
- \( \text{Mg}_3\text{P}_2 \): Insoluble, reacts
- \( \text{PH}_3 \): 26cc in 100 ml water at 17°C

Appearance and Odour:
Magtoxin and magnesium phosphide are a dark charcoal grey. The paper covering the polyethylene matrix of the Degesch Plate and Degesch Strip is yellow in colour. The hydrogen phosphide (phosphine, \( \text{PH}_3 \)) gas produced by these products has an odour described as similar to garlic, carbide or decaying fish.

Specific Gravity:
- \( \text{Mg}_3\text{P}_2 \): 2.06

Melting Point:
- \( \text{Mg}_3\text{P}_2 \): >1.000 °C
- \( \text{PH}_3 \): -133.5 °C

SECTION IV – FIRE AND EXPLOSION HAZARD DATA

Flash Point:
Magnesium phosphide and Magtoxin are not themselves flammable. However, they react readily with water to produce hydrogen phosphide (phosphine, \( \text{PH}_3 \)) gas, which may ignite spontaneously in air at concentrations above its LEL of 1.8 v/v. UEL of hydrogen phosphide is not known. The paper covering and polyethylene matrix of the Degesch Plate and Degesch Strip is flammable.

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 Magtoxin.

Unusual Fire and Explosion Hazards:
Do not confine partially spent magnesium phosphide or hydrogen phosphide gas at levels above 1.8% v/v. the gas may ignite spontaneously in air above this concentration. Open containers of magnesium phosphide fumigants in open air only and never in a flammable 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 the material 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.

\[
2\text{PH}_3 + 4\text{O}_2 \rightarrow 3\text{H}_2\text{O} + \text{P}_2\text{O}_5 \rightarrow 2\text{H}_3\text{PO}_4
\]
SECTION V – REACTIVITY DATA

Stability:
Magnesium phosphide is stable to most chemical reactions, except for hydrolysis. Magtoxin, Degesch Plate and Degesch Strip will react with moist air, liquid water, acids and some other liquids to produce toxic and flammable hydrogen phosphide gas. Magnesium phosphide is more reactive than aluminium phosphide and will liberate hydrogen phosphide more rapidly and more completely at lower temperatures and humidities.

Incompatibility:
Avoid contact with water and oxidising 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:
Magnesium phosphide and hydrogen phosphide gas from these fumigants are not absorbed dermally. Primary routes of exposure are inhalation and ingestion.

Acute and Chronic Health Hazards:
Magnesium phosphide is a highly acute toxic substance. Hydrogen phosphide gas LC_{50} is about 190 ppm for one-hour inhalation exposure. The acute oral toxicity of the Magtoxin formulation was found to be 9.1 mg/kg of body weight. Magnesium phosphide is not known to cause chronic poisoning.

Carcinogenicity:
Magnesium phosphide is not known to be carcinogenic and is not listed as such by NTP, IARC or OSHA.

Signs and Symptoms of Exposure:
Magnesium phosphide fumigant products 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 above the stomach, chest pain, diarrhoea 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 colour), unconsciousness and death.
Emergency and First Aid Procedures:
Symptoms of overexposure are headache, dizziness, nausea, difficult breathing, vomiting and diarrhoea. In all cases of overexposure get medical attention immediately. Take victim to a doctor or emergency treatment facility.

If the gas or dust from magnesium phosphide is inhaled:
Get exposed person to fresh air. Keep warm and make sure person can breath 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 magnesium 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 to an unconscious person.

If powder or granules of magnesium 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 – SPILL OR LEAK PROCEDURES

Spill Cleanup Procedures:
If possible, dispose of spilled Degesch Plate or Strip 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, pouches, or containers may be temporarily repaired using aluminium tape. 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 5 litres (1 gallon). Do not add more than about 0.5 kg (1 lb) 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 Degesch Plates or Strips.

Respiratory protection will most likely be required during cleanup of spilled magnesium phosphide fumigants. If the concentration of hydrogen phosphide is unknown, NIOSH/MSHA approved SCBA or its equivalent must be worn.

Small amounts of spillage, from about 2 to 4 kg (4 to 9 lbs) may be spread out over the ground in an open area to be deactivated by atmospheric moisture. Alternatively, spilled magnesium phosphide may be deactivated by the wet method as described in the following.

Wet Deactivation:
1. Spilled magnesium phosphide fumigants, Degesch Plates and Strips may be deactivated with water. Do not use detergent for the deactivation of these products. 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 is added slowly to the water. Degesch Plates and Strips may ignite during wet deactivation if they are allowed to float to the surface. Add weights or otherwise ensure that they stay submerged until deactivation is complete.
3. Due to the reactivity of magnesium phosphide, additions of spilled product to the water should be made slowly and carefully. This should be done in open air and respiratory protection will probably be required.
4. Allow the mixture to stand, with occasional stirring, for about 24 hours. Do not cover the container. The mixture will then be safe for disposal.
5. 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 slurry of spent dust from the tablets or pellets may be poured into a storm sewer or out onto the ground.
Disposal of Spent Magtoxin Tablets, Pellets, Degesch Plates and Degesch Strips:
When being disposed of, spilled or partially reacted magnesium phosphide fumigants are considered hazardous wastes under existing Federal Regulations. If properly exposed, the greyish-white residual dust from Magtoxin and spent Plate or Strip will normally contain only a very small amount of unreacted magnesium phosphide and will be safe for disposal. However, the residuals from incompletely exposed magnesium phosphide fumigants may require special care.

Triple rinse flasks, tins 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 sanitary sewer, sanitary landfill or by other approved procedures. Or, it is permissible to remove lids and expose empty flasks to atmospheric conditions until 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 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 hazard. Small amounts of hydrogen phosphide may be given off from unreacted magnesium 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. Residuals from magnesium phosphide fumigants may also be collected and disposed of in a sanitary landfill, incinerator or other approved sites or by other procedures approved by Federal, State or Local authorities.
4. From 1 to 2 kg (2 to 4 lbs) of spent fumigant may be collected for disposal in an open 1-gallon bucket. **Caution:** Do not collect dust in a large drum, dumpsters, plastic bags or other containers where confinement may occur. Transport the buckets in an open vehicle for disposal or deactivation.

Deactivation of Partially Spent Magtoxin Degesch Plate and Degesch Strip:
Magtoxin, Degesch Plates and Strips which are only partially spent may be rendered inactive by either a “dry” or “wet” deactivation method. The “dry” method entails holding the Plates or Strips out of doors in locked, 30-gallon wire baskets, which are available from DEGESCH America, Inc. or your supplier. Protect the partially spent magnesium phosphide fumigants from rain. The deactivated products 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 magnesium phosphide in closed containers may result in a fire hazard.

Alternatively, partially spent Plates or Strips and dust from Magtoxin fumigants may be treated by 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. Detergent is not necessary for the deactivation of spent magnesium phosphide fumigants.
2. The spent material is added slowly to the water. Degesch Plates or Strips may ignite during wet deactivation if they are allowed to float to the surface. Add weights or otherwise ensure that they stay submerged until deactivation is complete.
3. Partially spent Degesch Plates or Strips may react quite vigorously during wet deactivation if they were exposed under cold and/or dry conditions, or if the fumigation period was shortened. It is suggested that a small portion of the product be tested prior to immersing large amounts of material in water if it is suspected that the product contains considerable untreated magnesium phosphide.
4. Due to the reactivity of magnesium phosphide, additions to the water should be made slowly and carefully. Deactivation should be carried out in open air and respiratory protection may be required.
5. Allow the mixture to stand with occasional stirring. Do not cover the container.
6. Dispose of the deactivated material, with or without preliminary decanting, at a sanitary landfill, the slurry of spent dust from tables or pellets may be poured into a storm sewer or out onto the ground.
Precautions to be Taken in Handling and Storage:
Store Magtoxin, Degesch Plate and Degesch Strip products in a locked, dry, well-ventilated area away from heat. Post as a pesticide storage area. Do not store in building inhabited by humans or domestic animals.

Other Precautions:
1. Do not allow water or other liquids to contact magnesium phosphide fumigants.
2. Do not pile up large quantities of magnesium phosphide products during fumigation or disposal.
3. Once exposed, do not confine the fumigant or otherwise allow hydrogen phosphide concentration to exceed the LEL.
4. Open containers of Magtoxin, Degesch Plates and Degesch Strips 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. See EPA approved labelling for additional precautions and directions for us.
6. Magtoxin, Degesch Plates and Strips are restricted use pesticides due to acute inhalation toxicity of highly toxic hydrogen phosphide (phosphine PH₃) 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.

SECTION VIII – CONTROL MEASURES

Respiratory Protection:
NIOSH/MSHA approved full-face mask with approved canister for phosphine (hydrogen phosphide, PH₃) may be worn at concentrations up to 15 ppm. At levels above this, or where the hydrogen phosphide concentration is unknown, NIOSH/MSHA approved SCBA or equivalent must be worn.

Protective Clothing:
Wear gloves when handling magnesium phosphide tables and pellets.

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.

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, expressed or implied and we assume no responsibility for any loss, damage or expense, direct or consequential, arising out of their use.