

Shoreside Organics LLC
65 State Street
Narragansett, RI 02882

April 20, 2015

National List Manager
USDA/AMS/NOP, Standards Division
1400 Independence Ave. SW
Room 2648-So., Ag Stop 0268
Washington, DC 20250-0268

Dear Devon Pattillo,

Item A

We are requesting the addition of "Squid and Squid byproducts" to the National List of Allowed and Prohibited Substances ("National List") section 205.601(j)(7). We are asking that squid be in the same category as Fish Products under OMRI definitions for use in organic production.

Item B

#B.1 – *Loligo Pealei* and *Illex Illecebrosus*, whole and the byproducts of. Squid are non-synthetic organic material. We will use food grade synthetic Phosphoric acid 75%, Citric or Sulfuric acid to stabilize the liquid squid fertilizer. The same acids allowed under OMRI to stabilize fish products. The amount of acid used cannot exceed the minimum amount needed to lower the pH to 3.5.

#B.2 – Shoreside Organics LLC
65 State Street
Narragansett, RI 02882
Peter Barbera – General Manager
peter@seafreezeltd.com
401 -439 -5540 Cell
401-267- 4473 Office

#B.3 – The intended use is to product an organic fertilizer for agriculture.

#B.4 – The squid based fertilizer can be used on all types of crops. The substance rate will be determined by the requirements of the grower. A general recommended rate of application is as follows:

Lawns – 4 ounces per gallon of water for 500 square feet.

Indoor plants – 1 ounces per gallon of water in weekly watering.

Corn – 1 to 2 gallon per acre

Vegetables – 1 to 2 gallon per acre at planting then every 6 weeks.

Fruits – 2 gallon per acre 2 weeks before leaf emergence and again at the beginning of fruiting.

Outdoor flowers – 1 to 2 ounces per 10 gallon of irrigation water.

#B.5 – The source of the squid maybe whole product but in most cases will be squid byproduct. Byproduct is the remaining organic parts of the squid that are left after processing (cleaning) for use in the production of calamari. In many cases this byproduct is going to landfill for disposal. The process we will be using is to grind the squid and squid byproducts, we add a non GMO enzyme at 1.2% (see attachment #1 and 2) at low temperature approximately 125 degrees F to hydrolyse it for 30 minutes. Then add 3 to 5% organic potassium sulfate of potash for 30 minutes (see attached #3) and 3 to 5% food grade phosphoric acid 75%, citric or sulfuric to stabilize the product for 60 minutes. It is screened of solids and bottled for use.

#B.6 – We have filed with OMRI an application kit for Shoreside Organic “Liquid Squid 2-2-2” on 3/12/2015. On 3/13/2015 we received an email back from OMRI stating that there was some misinformation from OMRI technical team about allowance for squid, we call called prior about the use of squid and was told it would fall under “Fish Products”. This lead to our filing a petition with you for the allowance of squid as a fish product. We are unaware of any other previous reviews or certifications by State or private organizations.

#B.7 – Currently OMRI doesn’t consider squid a fish product. But many other State and Federal agency consider squids under fish and seafood.

FDA – “The Seafood List” has squid listed along with all of the other fish species.

NOAA Fisheries – groups squid with mackerel and butterfish and manages all three under the same fisheries plan.

FDA – Food Facility Registration has squid under Fisher/Seafood Products categories.

MAFMC (Mid-Atlantic Fishery Council) – Species Stock Status, groups squids with all other fish.

CFR – Code of Federal Regulations Title 21 – Lists fresh fish, including only fresh and frozen fish, shellfish and other aquatic animals.

Under the Animal Kingdom Classification fish are closer to animals than squids.

#B.8 – These are the CAS number for the additives we may be using:

Food Grade Phosphoric Acid 7664-38-2

Food Grade Citric Acid 77-92-9

Food Grade Sulfuric Acid 7664-93-9

Corolase enzyme 9001-92-7

Potassium Sulfate of Potash 7778-80-5

Sample product label and A & L Western Lab reports (see attachment #4 and 5)

The amino acid profile report of Squid hydrolysate shows a range of beneficial amino acids to plant health, as reported to us by Dr. Rebecca Brown, University of Rhode Island, Plant and Soil Science.

#B.9

a) We know of no chemical interactions of the petitioned substance – Squid.

b) Squid doesn't have any known toxicity or environment persistence. Squid ink is nontoxic to humans and other animal as stated by Senior Marine Biologist Steven Webster at the Monterey Bay Aquarium, Monterey, CA

c) The environmental impacts from the materials use is that the less we have to landfill the better. It is currently a wasted protein byproduct. It has a beneficial impact on soil health with its amino acid and natural organic protein.

From its manufacture there is no waste stream of unused additives or byproducts.

d) Effect on human health have shown beneficial properties of squid. New research has shown that squid ink protects white blood cell production, antitumor characteristics among other good properties. We have not found any detrimental health effects of squid.

e) Effects on soil organisms have shown to be beneficial to increase soil water and nutrient holding capacity. Promoting the growth of beneficial soil organisms and

higher microbial activity rates than their synthetic counterparts regardless of application rate. As stated by Dr. Rebecca Brown and Joseph C Fetter at University of Rhode Island 2008-2009.

#B.10 – MSDS for synthetic acid. Phosphoric acid, Citric acid and Sulfuric acid. (See attached #6)

NIEHS for Citric and Phosphoric acids I could not find. Did find report for Sulfuric acid (see attachment #7)

#B.11 – Squid fertilizer like all other fish based fertilizers must be acid stabilized or the product will decompose. This decomposition will cause the finished product in a container to build up gasses and rupture the container spilling the product. Synthetic acid stabilize this decomposition and give the product shelf life.

As stated above in the University of Rhode Island study and other studies squid fertilizer has many beneficial aspects. The A & L Western lab report shows a good amino acid profile and organic nutrients help both soil and plants. Any fish based fertilizer will have good benefit to soil and plants.

Chemical based fertilizers work well but basically sterilize the land and if not careful can do a lot of environmental harm in their use and manufacture.

We have not heard of any detrimental effect of squid based fertilizer.

#B.12 – E – Squid and squid byproducts are a good source of organic nitrogen and a great source of amino acids that benefit the soil and water retention. Any organic fish fertilizers, animal waste fertilizer not just squid could be used and have a benefit over chemical fertilizers which apart from the benefit on adding N-P-K it does nothing but harm the soil and surrounding environment. The beneficial effects to the environment are great for the soil and reduction in landfill waste helps the local environment.

We have a locally available waste stream in squid waste and a need for organic fertilizer.

Synthetic chemical fertilizer will work to grow plants it is well known fact, the question is it the best solution?

#B.13- We are not claiming any Confidential Business Information Statement.

Thank you, if you need any further information, please contact me by phone at 401-439-5540 or e-mail peter@seafreezeltd.com

Sincerely,

A handwritten signature in blue ink that reads "Peter Barbera". The signature is written in a cursive style with a large initial "P".

Peter Barbera

Shoreside Organics LLC

Attachment # 1

AB



Enzymes

an ABF ingredients company

AB Enzymes GmbH · Postfach 10 12 39 · D-64212 Darmstadt

Kontakt/Zeichen RA

Telefon +49(0)6151/3680-100

Telefax +49(0)6151/3680-120

E-Mail info@abenzymes.com

Darmstadt 2010-08-23

Statement concerning the genetic status:

• **Corolase® 7089**

We confirm that for production of enzymatic activity within above listed product, micro-organisms have been used, which are not genetically modified.

Only gmO-free agricultural substrates are in use as raw materials for the fermentation processes. For blending of the product only non-gm materials are in use.

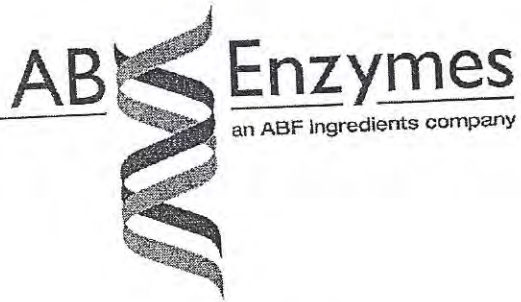
We like to indicate that our products are to be used as processing aids in the food manufacturing process and are thus free from any labelling provisions in the European Union.

The product is not falling within the scope of EU regulations (EC) 1829/2003 and (EC) 1830/2003 on genetically modified food and feed.

AB Enzymes GmbH
Darmstadt

Product Management Food & Specialities

Attachment # 2



Certificate of Analysis

Seafreeze Shoreside, Inc.
75 State Street
Narragansett RI 02882

Page 1 / 1

| | |
|----------------------|------------------|
| Your Order No. | Peter |
| Our Order Name | 22160753 |
| Product Name | COROLASE 7089 |
| Total Order Quantity | 150 KG |
| Batch Quantity | 75 KG |
| Batch Code | F140149ST |
| Production Date | 06/18/2014 |
| Best-before Date | 06/18/2016 |

| Analysis | Method | UoM | Specification | Result |
|-----------------|----------|------------|---------------|--------|
| Protease | B052-G | UHb/g(6,8) | Min. 840 | 1160 |
| Chloramphenicol | LC-MS/MS | µg/kg | Max. 0.3 | < 0.3 |

CAP results are based on analyses according to our sampling plan.

Dr. Jungschaffer (Quality Manager)

This document was created automatically and is valid without a signature.

Statement of the above data does not release the buyer from his legal obligation to examine the material on receipt. These data cannot be construed as a legal warranty or guarantee of certain properties of the product for a specific application.

Bank of America
ACH 111000012
Account number 4427576236
Routing / Transit (ABA) Number 0260-0959-3
SWIFT Address BOFAUS3N

AB Vista, Inc. d/b/a AB Enzymes
Sabadell Financial Center
150 S. Pine Island Road Suite 270
Plantation, Florida 33324
Tel: 1-888-512-2176



OMRI Listed®

The following product may be used in certified organic production or food processing and handling in accordance with the Canadian Organic Standards.

Product

Allganic Potassium Sulfate of Potash Water Soluble 0-0-52

Company

SQM North America Corp.
Mr. Jason Woulfin
2727 Paces Ferry Rd, Bldg Two, Ste 1425
Atlanta, GA 30339

Status

Allowed

Category

COR: Potassium sulphate

Issue date

02-Sep-2014

Product number

sqm-4541

Class

Crop Fertilizers and Soil Amendments

Expiration date

01-Dec-2015

Restrictions

Not applicable.

Peggy Mears

Executive Director

Product review is conducted according to the policies in the current *OMRI Policy Manual*® and based on the standards in the applicable *OMRI Standards Manual*®. To verify the current status of this or any OMRI Listed product, view the most current version of the *OMRI Canada Products List*® at OMRI.org. OMRI listing is not equivalent to organic certification and is not a product endorsement. It cannot be construed as such. Final decisions on the acceptability of a product for use in a certified organic system are the responsibility of a CFIA accredited Certification Body. It is the operator's responsibility to properly use the product, including following any restrictions.



Organic Materials Review Institute
P.O. Box 11558, Eugene, OR 97440-3758, USA

SHORESIDE ORGANICS

"Liquid Squid 2-2-2"

Guaranteed Analysis

| | |
|--|------|
| Total Nitrogen (N) | 2.0% |
| 1.7% Water Insoluble Organic Nitrogen | |
| 0.3% Water Soluble Nitrogen | |
| Available Phosphate (P ₂ O ₅) | 2.0% |
| Soluble Potash (K ₂ O) | 2.0% |

Shoreside Organics LLC
65 State Street
Narragansett, RI 02882

A & L WESTERN AGRICULTURAL LABORATORIES

1311 WOODLAND AVE #1 • MODESTO, CALIFORNIA 95351 • (209) 529-4080 • FAX (209) 529-4736



Attachment #5

CLIENT NO: 9999-D

SEND TO: SEAFREEZE SHORESIDE
75 STATE STREET
NARRAGANSETT, RI 02882-

SUBMITTED BY: PETER BARBERA

CUSTOMER:

LAB NO: 23720

DATE: 03/13/2015

ORGANIC FERTILIZER REPORT

PAGE: 1

| SAMPLE ID | REPORT OF ANALYSIS IN PERCENT | | | | | | | | | REPORT OF ANALYSIS IN PARTS PER MILLION | | | | | | |
|-----------|-------------------------------|--------------|---|-------------|-------------------------|----------|--------------|------------|-----------|---|-------------|--------------|-----------|---------|-----|--|
| | Nitrogen N | Phosphorus P | Phosphate P ₂ O ₅ | Potassium K | Potash K ₂ O | Sulfur S | Magnesium Mg | Calcium Ca | Sodium Na | Iron Fe | Aluminum Al | Manganese Mn | Copper Cu | Zinc Zn | B | |
| 3/2 SQUID | 1.92 | 0.82 | 1.88 | 1.540 | 1.855 | 0.860 | 0.060 | 0.080 | 0.170 | 51 | 9 | 2 | 48 | 20 | 5.0 | |

| SAMPLE ID | POUNDS OF NUTRIENTS / TON | | | | | | | | | | | | | | | |
|-----------|---------------------------|--------------|---|-------------|-------------------------|----------|--------------|------------|-----------|---------|-------------|--------------|-----------|---------|-------|--|
| | Nitrogen N | Phosphorus P | Phosphate P ₂ O ₅ | Potassium K | Potash K ₂ O | Sulfur S | Magnesium Mg | Calcium Ca | Sodium Na | Iron Fe | Aluminum Al | Manganese Mn | Copper Cu | Zinc Zn | B | |
| 3/2 SQUID | 38.4 | 16.4 | 37.6 | 30.8 | 37.1 | 17.2 | 1.2 | 1.6 | 3.4 | 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | |

Reported on an as-received basis Moisture = 79.81%

Reported on a dry basis Moisture =

Remarks:

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This report applies only to the sample(s) tested. Samples are retained a maximum of thirty days after testing.

Robert Butterfield
A & L WESTERN LABORATORIES, INC.

A & L WESTERN AGRICULTURAL LABORATORIES, INC.

Report No: 14-275-081

1311 Woodland Avenue, Suite 1 • Modesto, California 95351 • (209) 529-4080



Account No: 99999-D

Send to: GURRY INVESTMENTS, INC
101 TREMONT STREET
BOSTON, MA 02108

Project Id: LOLOGIA SQUID HYDROSLATE

Submitted by: CARL REETZ

Lab Number: 21202

Sample ID: SQUID HYDROSLATE

Date Received: 10/02/2014

Date Reported: 11/07/2014

AMINO ACID PROFILE REPORT

| Detection Limit % | Analyte | Level Found % | Method Code |
|----------------------|---------------|------------------|-------------|
| 0.01 | Alanine | 0.91 | HPLC-PCD |
| 0.01 | Arginine | 1.10 | HPLC-PCD |
| 0.01 | Aspartic acid | 1.32 | HPLC-PCD |
| 0.01 | Cystine | 0.14 | HPLC-PCD |
| 0.01 | Glutamic acid | 1.84 | HPLC-PCD |
| 0.01 | Glycine | 0.80 | HPLC-PCD |
| 0.01 | Histidine | 0.32 | HPLC-PCD |
| 0.01 | Isoleucine | 0.70 | HPLC-PCD |
| 0.01 | Leucine | 1.15 | HPLC-PCD |
| 0.01 | Total lysine | 1.15 | HPLC-PCD |
| 0.01 | Methionine | 0.20 | HPLC-PCD |
| 0.01 | Phenylalanine | 0.60 | HPLC-PCD |
| 0.01 | Proline | 0.86 | HPLC-PCD |
| 0.01 | Tryptophan | 0.04 | HPLC-PCD |
| 0.01 | Serine | 0.62 | HPLC-PCD |
| 0.01 | Threonine | 0.67 | HPLC-PCD |
| 0.01 | Tyrosine | 0.60 | HPLC-PCD |
| 0.01 | Valine | 1.06 | HPLC-PCD |

BDL INDICATES THE LEVEL FOUND IS BELOW THE ESTABLISHED LIMIT FOR THAT ANALYTE.

A & L Western Agricultural Laboratories

Robert Butterfield
Laboratory Director

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1311 Woodland Avenue, Suite 1 • Modesto, California 95351 • (209) 529-4080



Report No: 14-275-081

Account No: 99999-D

Send to: GURRY INVESTMENTS, INC
101 TREMONT STREET
BOSTON, MA 02108

Project Id: LOLOGIA SQUID HYDROSLATE

Submitted by: CARL REETZ

Lab Number: 21202

Sample ID: SQUID HYDROSLATE

Date Received: 10/02/2014

Date Reported: 11/07/2014

NON-NUTRITIVE METALS

Sample Preparation Method: EPA SW846-3050B

| Detection Limit mg/kg | Analyte | Level Found mg/kg | Method Reference |
|--------------------------|------------|----------------------|------------------|
| 0.25 | Arsenic | 3.48 | EPA SW846-6010 |
| 0.03 | Cadmium | 8.18 | EPA SW846-6010 |
| 0.1 | Cobalt | 0.3 | EPA SW846-6010 |
| 0.5 | Lead | BDL | EPA SW846-6010 |
| 0.1 | Molybdenum | 0.5 | EPA SW846-6010 |
| 0.1 | Nickel | 1.1 | EPA SW846-6010 |
| 0.5 | Selenium | 1.7 | EPA SW846-6010 |
| 0.05 | Zinc | 22.8 | EPA SW846-6010 |
| 0.05 | Mercury | BDL | EPA SW846-7471A |

BDL - INDICATES THE LEVEL FOUND IS BELOW THE ESTABLISHED DETECTION LIMIT FOR THAT ANALYTE.
ANALYZED ON AN AS RECEIVED BASIS

A & L Western Agricultural Laboratories

Robert Butterfield
Laboratory Director

Brenntag Canada Inc.

BRENNTAG

MATERIAL SAFETY DATA SHEET

CITRIC ACID ANHYDROUS, SOLID

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Brenntag Canada Inc.
43 Jutland Rd.
Toronto, ON
M8Z 2G6
(416) 259-8231

WHMIS#: 00060156
Index: GCD0872/14D
Effective Date: 2014 October 17
Date of Revision: 2014 October 17

Website: <http://www.brenntag.ca>

EMERGENCY TELEPHONE NUMBER (For Emergencies Involving Chemical Spills or Releases)

1 855 273 6824

PRODUCT IDENTIFICATION

Product Name: Citric Acid Anhydrous, Solid.

Chemical Name: 2-Hydroxy-1,2,3-propanetricarboxylic acid.

Synonyms: Citric Acid USP-FCC (Food Grade); Beta-hydroxytricarballic acid; Citric Acid USP23; Citric Acid BP93.

Chemical Family: Organic Acid.

Molecular Formula: C₆H₈O₇.

Product Use: Acidulant, pH regulator, pharmaceutical preparations, antioxidant synergist, flavour enhancer and sequestering agent in processed food and beverages. Food additive.

WHMIS Classification / Symbol:

E: Corrosive



READ THE ENTIRE MSDS FOR THE COMPLETE HAZARD EVALUATION OF THIS PRODUCT.

2. COMPOSITION, INFORMATION ON INGREDIENTS (Not Intended As Specifications)

| Ingredient | CAS# | ACGIH TLV (TWA) | % Concentration |
|-------------|---------|-----------------|-----------------|
| Citric Acid | 77-92-9 | — | 95 - 100 |

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Corrosive! Toxic effects are principally related to its corrosive properties. Brief contact with the dust causes irritation. Greater exposure causes severe burns. In the presence of moisture (perspiration, humidity, tears), the dust dissolves to form a corrosive solution which may cause burns. (3) Human experience and animal studies indicate that acidic compounds (pH less than 3.5) may cause irritation and burns. (3) Causes severe skin and eye burns. Dust is irritating to respiratory tract. See "Other Studies Relevant to Material". Powdered material may form explosive dust-air mixtures. Can decompose at high temperatures forming toxic gases.

POTENTIAL HEALTH EFFECTS

Inhalation: Corrosive! Brief contact with the dust causes irritation. Greater exposure causes severe burns. In the presence of moisture (perspiration, humidity, tears), the dust dissolves to form a corrosive solution which may cause burns. (3) Excessive contact with powder may cause drying of mucous membranes of nose and throat due to absorption of moisture and oils.

| | |
|-----------------------|--|
| Skin Contact: | Corrosive! Brief contact with the dust causes irritation. Greater exposure causes severe burns. In the presence of moisture (perspiration, humidity, tears), the dust dissolves to form a corrosive solution which may cause burns. (3) |
| Skin Absorption: | Not likely to be absorbed through the skin. |
| Eye Contact: | Corrosive! Human experience and animal studies indicate that acidic compounds (pH less than 3.5) may cause irritation and burns. (3) This product causes immediate pain, severe burns and permanent corneal damage which may result in blindness. Excessive contact with powder may cause drying of mucous membranes of the eyes due to absorption of moisture and oils. |
| Ingestion: | Corrosive! This product causes severe burning and pain in the mouth, throat and abdomen. Vomiting, diarrhea and perforation of the esophagus and stomach lining may occur. Prolonged and repeated exposure may cause tooth erosion and nausea and vomiting. |
| Other Health Effects: | <p>Corrosive effects on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain. Strict adherence to first aid measures following any exposure is essential.</p> <p>In general, long-term exposure to high concentrations of dust may cause increased mucous flow in the nose and respiratory system airways. This condition usually disappears after exposure stops. (4)</p> <p>May cause tooth erosion. Ingestion of citric acid frequently or in large quantities can cause tooth erosion and irritation to the digestive system. (4)</p> |

4. FIRST AID MEASURES

FIRST AID PROCEDURES

| | |
|---------------------|--|
| Inhalation: | Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Oxygen administration may be beneficial in this situation but should only be administered by personnel trained in its use. Obtain medical attention IMMEDIATELY. |
| Skin Contact: | Prompt removal of the material from the skin is essential. Remove all contaminated clothing and immediately wash the exposed areas with copious amounts of water for a minimum of 30 minutes or up to 60 minutes for critical body areas. Obtain medical attention IMMEDIATELY. See "Note to Physicians" below. |
| Eye Contact: | Immediately flush eyes with running water for a minimum of 30 minutes, preferably up to 60 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Do not transport victim until the recommended flushing period is completed unless flushing can be continued during transport. |
| Ingestion: | Do not attempt to give anything by mouth to an unconscious person. If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. DO NOT induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention IMMEDIATELY. |
| Note to Physicians: | <p>Due to the severely irritating or corrosive nature of the material, swallowing may lead to ulceration and inflammation of the upper alimentary tract with hemorrhage and fluid loss. Also, perforation of the esophagus or stomach may occur, leading to mediastinitis or peritonitis and the resultant complications.</p> <p>Mucosal injury following ingestion of this corrosive material may contraindicate the induction of vomiting in the treatment of possible intoxication. Similarly, if gastric lavage is performed, intubation should be done with great care. If oral burns are present or a corrosive ingestion is suspected by the patient's history, perform esophagoscopy as soon as possible. Scope should not be passed beyond the first burn because of the risk of perforation.</p> <p>Medical conditions that may be aggravated by exposure to this product include diseases of the skin, eyes or respiratory tract.</p> |

5. FIRE-FIGHTING MEASURES

| Flashpoint (°C) | Autoignition Temperature (°C) | Flammability Limits in Air (%): | |
|--------------------------------|---|---------------------------------|----------------|
| | | LEL | UEL |
| Not available. | Not available. | Not available. | Not available. |
| Flammability Class (WHMIS): | Not regulated. | | |
| Hazardous Combustion Products: | Thermal decomposition products are toxic and may include oxides of carbon and irritating gases. | | |

| | |
|------------------------------------|---|
| Unusual Fire or Explosion Hazards: | In common with many organic chemicals in powder form, this product may be capable of forming flammable dust clouds in air. Avoid accumulation and dispersion of dust to reduce explosion potential. Minimize air borne spreading of dust. Spilled material may cause floors and contact surfaces to become slippery. Enforce NO SMOKING rules in area of use. |
| Sensitivity to Mechanical Impact: | Not expected to be sensitive to mechanical impact. |
| Rate of Burning: | Not available. |
| Explosive Power: | Not available. |
| Sensitivity to Static Discharge: | Expected to be sensitive to static discharge when dust is present between the lower and upper explosive limits. |

EXTINGUISHING MEDIA

| | |
|---------------------------|---|
| Fire Extinguishing Media: | Alcohol or polymer foam is preferred. Dry chemical, carbon dioxide or water spray. Water may cause frothing if it gets below the surface of the liquid and turns to steam. Water fog gently applied to the surface may cause frothing which may extinguish the fire. Use carbon dioxide or dry chemical media for small fires. If only water is available, use it in the form of a fog. |
|---------------------------|---|

FIRE FIGHTING INSTRUCTIONS

| | |
|-------------------------------------|---|
| Instructions to the Fire Fighters: | Use water spray to cool fire-exposed containers or structures. Use water spray to disperse vapours. Clean up immediately to eliminate slipping hazard. Isolate materials that are not involved in the fire and protect personnel. Spilled material may cause floors and contact surfaces to become slippery. Do not use solid water streams near ruptured tanks or spills. Reacts violently with water and can splatter onto personnel. (3) |
| Fire Fighting Protective Equipment: | Use self-contained breathing apparatus and protective clothing. Protective clothing for skin and eye protection should be worn to protect against corrosive materials. |

6. ACCIDENTAL RELEASE MEASURES

Information in this section is for responding to spills, leaks or releases in order to prevent or minimize the adverse effects on persons, property and the environment. There may be specific reporting requirements associated with spills, leaks or releases, which change from region to region.

| | |
|--------------------------------------|--|
| Containment and Clean-Up Procedures: | In all cases of leak or spill contact vendor at Emergency Number shown on the front page of this MSDS. Minimize air borne spreading of dust. Ventilate enclosed spaces. Eliminate all sources of ignition. Spilled material may cause floors and contact surfaces to become slippery. Wear respirator, protective clothing and gloves. Avoid dry sweeping. Do not use compressed air to clean surfaces. Vacuuming is preferred. Return all material possible to container for proper disposal. Where a package (drum or bag) is damaged and / or leaking, repair it, or place it into an over-pack drum immediately so as to avoid or minimize material loss and contamination of surrounding environment. Any recovered product can be used for the usual purpose, depending on the extent and kind of contamination. Collect product for recovery or disposal. Ventilate enclosed spaces. Notify applicable government authority if release is reportable or could adversely affect the environment. |
|--------------------------------------|--|

7. HANDLING AND STORAGE

HANDLING

| | |
|---------------------------|--|
| Handling Practices: | Avoid accumulation and dispersion of dust to reduce explosion potential. Use normal "good" industrial hygiene and housekeeping practices. Clean up immediately to eliminate slipping hazard. Avoid moisture contamination. When diluting, add this material/product to water in small amounts to avoid spattering. Never add water to this material/product. The water should be lukewarm. Always add product slowly to liquid surface, with constant stirring to assure that product is completely dissolved as it is added to dissipate heat. |
| Ventilation Requirements: | See Section 8, "Engineering Controls". |
| Other Precautions: | Use only with adequate ventilation and avoid breathing dusts (vapours or mists). Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use. Corrosive residue is most likely to be deposited at process vents or storage tanks, especially during filling operations. The use of compressed air to force corrosive materials from delivery trucks is of special concern. Scrubbing the exhaust of these vents is highly recommended. Jurisdictional regulations should be consulted to determine required practices. |

STORAGE

| | |
|---------------------------|-------------------------------|
| Storage Temperature (°C): | Do not store above 30 °C. (3) |
|---------------------------|-------------------------------|

| | |
|---|---|
| Ventilation Requirements: | Ventilation should be corrosion and explosion proof. |
| Storage Requirements: | Prolonged storage may result in lumping or caking. Store in a clean, cool well ventilated area, away from organic chemicals, strong bases, strong acids, metal powders, carbides, sulfides, and any readily oxidizable material. Protect from direct sunlight. Protect against physical damage. Storage area should be equipped with corrosion-resistant floors, sumps and should have controlled drainage to a recovery tank. |
| Special Materials to be Used for Packaging or Containers: | Materials of construction for storing the product include: fiberglass-reinforced polyester, polyethylene, polypropylene, 316 stainless steel or nickel-molybdenum alloys. Equipment for storage, handling or transport should NOT be made from the following material, or, where applicable, its alloys: 304 stainless steel, carbon steel, cast iron, copper, brass, aluminum, lead, nylon and Concrete. (4) Confirm suitability of any material before using. |

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Recommendations listed in this section indicate the type of equipment, which will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

ENGINEERING CONTROLS

Engineering Controls: Local exhaust ventilation required. Ventilation should be corrosion and explosion proof. Make up air should be supplied to balance air that is removed by local or general exhaust ventilation. Avoid accumulation and dispersion of dust to reduce explosion potential. Ventilate low lying areas such as sumps or pits where dense dust may collect.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye Protection: Safety glasses with side shields are recommended as minimal eye protection. Use dust-tight chemical safety goggles when there is potential for eye contact. Contact lenses should not be worn when working with this material.

Skin Protection: Gloves and protective clothing made from nitrile rubber, neoprene, butyl rubber, viton, polyethylene, PVC or natural rubber should be impervious under conditions of use. Do not use gloves or protective clothing made from polyvinyl alcohol (PVA). (4) Prior to use, user should confirm impermeability. Discard contaminated gloves.

Respiratory Protection: No specific guidelines available. A NIOSH/MSHA approved dust mask for concentrations of nuisance dust up to 100 mg/m³ particulate may be adequate. An air-supplied respirator if concentrations are higher or unknown.

Other Personal Protective Equipment: Wear an impermeable apron and boots. Locate safety shower and eyewash station close to chemical handling area. Take all precautions to avoid personal contact.

EXPOSURE GUIDELINES

Particulate Not Otherwise Classified:

| ACGIH | OSHA |
|--|--|
| 10 mg/m ³ - Inhalable particulate | 50 mppcf* or 15 mg/m ³ - Total Dust |
| 3 mg/m ³ - Respirable particulate | 15 mppcf* or 5 mg/m ³ - Respirable Fraction |

* mppcf = million particles per cubic foot

9. PHYSICAL AND CHEMICAL PROPERTIES (Not intended as Specifications)

| | |
|---|--|
| Physical State: | Solid. |
| Appearance: | Colourless transparent crystals or white powder. |
| Odour: | Odourless. |
| Odour Threshold (ppm): | Not applicable. |
| Boiling Range (°C): | Decomposes at 175. (4) |
| Melting/Freezing Point (°C): | 153. (3) |
| Vapour Pressure (mm Hg at 20° C): | Not applicable. |
| Vapour Density (Air = 1.0): | Not applicable. |
| Relative Density (g/cc): | 1.665. (3) |
| Bulk Density: | 500 - 900 kg/m ³ . (3) |
| Viscosity: | Not applicable. |
| Evaporation Rate (Butyl Acetate = 1.0): | Not applicable. |
| Solubility: | Soluble in water. |
| % Volatile by Volume: | 0. |

| | |
|--|-----------------|
| pH: | 1.7 - 1.8. (3) |
| Coefficient of Water/Oil Distribution: | < 0. (3) |
| Volatile Organic Compounds (VOC): | Not applicable. |
| Flashpoint (°C): | Not available. |

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY

| | |
|---------------------------------------|---|
| Under Normal Conditions: | Stable. |
| Under Fire Conditions: | In common with many organic chemicals in powder form, this product may be capable of forming flammable dust clouds in air. Material will not burn unless preheated. |
| Hazardous Polymerization: | Will not occur. |
| Conditions to Avoid: | High temperatures, sparks, open flames and all other sources of ignition. Avoid accumulation and dispersion of dust to reduce explosion potential. Minimize air borne spreading of dust. Clean up immediately to eliminate slipping hazard. Temperatures above 40 °C. (3) Keep tightly closed to protect quality. |
| Materials to Avoid: | Strong oxidizers. Reducing agents. Strong bases. Metallic nitrates. Corrosive to aluminum, tin, zinc, copper and their alloys. Lead. Brass. 304 Stainless Steel. Carbon steel. Concrete. |
| Decomposition or Combustion Products: | Thermal decomposition products are toxic and may include oxides of carbon and irritating gases. |

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL DATA:

| SUBSTANCE | LD50 (Oral, Rat) | LD50 (Dermal, Rabbit) | LC50 (Inhalation, Rat, 4h) |
|--|---|-----------------------|----------------------------|
| Citric Acid | 3 000 mg/kg (1) | --- | --- |
| Carcinogenicity Data: | The ingredient(s) of this product is (are) not classed as carcinogenic by ACGIH, IARC, OSHA or NTP. See "Other Studies Relevant to Material". | | |
| Reproductive Data: | No adverse reproductive effects are anticipated. | | |
| Mutagenicity Data: | No adverse mutagenic effects are anticipated. | | |
| Teratogenicity Data: | No adverse teratogenic effects are anticipated. | | |
| Respiratory / Skin Sensitization Data: | None known. | | |
| Synergistic Materials: | None known. | | |
| Other Studies Relevant to Material: | A single drop of a 2% or 5% solution in water causes little or no irritation. A 0.5% solution held in contact with the eye causes irreversible tissue damage to the cornea. (4) Citric Acid caused mild irritation when 500 mg was tested on rabbit skin in a 24-hour test. (4) A daily dose of 1,380 mg/Kg fed to dogs for 112 to 120 days did not produce any symptoms of kidney damage or other toxic effects. Citric Acid (as the sodium salt) in the diet of rabbits at 7.7% for 150 days did not produce any toxic effects. (4) Diets containing 1.2% Citric Acid fed to rats over 2 successive generations (90 weeks) had no harmful effects on growth or reproduction. (4) A diet containing 5% Citric Acid fed to pregnant guinea pigs and rats had no adverse effects to growth or survival of young pups. This dietary level did not cause a slight retardation in body weight gain and survival of young rats on a calcium-reduced diet. (4) Citric Acid is an essential component of the body's processed for producing energy. It is continually produced and broken down. Even high doses would be rapidly cleared from the body. (4) | | |

12. ECOLOGICAL INFORMATION

| | |
|--------------|--|
| Ecotoxicity: | Not available. May be harmful to aquatic life. Toxicity is primarily associated with pH. |
|--------------|--|

Environmental Fate: Not available. Product has an unaesthetic appearance and can be a nuisance. This material is not expected to bioaccumulate. (3) Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

13. DISPOSAL CONSIDERATIONS

Deactivating Chemicals: Neutralize carefully with soda ash or sodium bicarbonate to a pH of 6 to 9. Neutralization is expected to be exothermic. Vigorous effervescence results. Confirm pH using pH paper.

Waste Disposal Methods: This information applies to the material as manufactured. Reevaluation of the product may be required by the user at the time of disposal since the product uses, transformations, mixtures and processes may influence waste classification. Dispose of waste material at an approved (hazardous) waste treatment/disposal facility in accordance with applicable local, provincial and federal regulations. Do not dispose of waste with normal garbage, or to sewer systems.

Safe Handling of Residues: See "Deactivating Chemicals". See "Waste Disposal Methods".

Disposal of Packaging: Empty containers retain product residue and can be dangerous. Treat package in the same manner as the product.

14. TRANSPORTATION INFORMATION

CANADIAN TDG ACT SHIPPING DESCRIPTION:

This product is not regulated by TDG.

Label(s): Not applicable. Placard: Not applicable.

ERAP Index: ----. Exemptions: None known.

US DOT CLASSIFICATION (49CFR 172.101, 172.102):

This product is not regulated by DOT.

Label(s): Not applicable. Placard: Not applicable.

CERCLA-RQ: Not available. Exemptions: None known.

15. REGULATORY INFORMATION

CANADA

CEPA - NSNR: All components of this product are included on the DSL.

CEPA - NPRI: Not included.

CANADIAN FOOD AND DRUG ACT/REGULATIONS: The use of this material/product as a food additive is regulated by Health Canada in the Food and Drug Act and the Food and Drug Regulations. It is incumbent on the user of this material/product to ensure any intended food application is consistent with Health Canada guidelines. Food Grade designation in no way implies that the product is safe for consumption by humans.

Controlled Products Regulations Classification (WHMIS):

E: Corrosive

USA

Environmental Protection Act: All components of this product are included on the TSCA inventory.

OSHA HCS (29CFR 1910.1200): Corrosive.

U.S. FOOD AND DRUG ADMINISTRATION: This material/product is regulated for use by the US FDA. It is incumbent on the user of this material/product to ensure any intended food application is consistent with US FDA guidelines. Food Grade designation in no way implies that the product is safe for consumption by humans.

NFPA: 1 Health, 1 Fire, 0 Reactivity (3)

HMIS: Health, Fire, Reactivity (Not available.)

INTERNATIONAL

All components of this product are found on the following inventories: EINECS (European Inventory of Existing Commercial Chemical Substances), China Inventory (IECS), Korea (ECL), Australia (ACQIN), Philippines Inventory of Chemicals and Chemical Substances (PICCS).

16. OTHER INFORMATION

REFERENCES

1. RTECS-Registry of Toxic Effects of Chemical Substances, Canadian Centre for Occupational Health and Safety RTECS database.
2. Clayton, G.D. and Clayton, F.E., Eds., Patty's Industrial Hygiene and Toxicology, 3rd ed., Vol. IIA,B,C, John Wiley and Sons, New York, 1981.
3. Supplier's Material Safety Data Sheet(s).
4. CHEMINFO chemical profile, Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada.
5. Guide to Occupational Exposure Values, 2011, American Conference of Governmental Industrial Hygienists, Cincinnati, 2011.
6. Regulatory Affairs Group, Brenntag Canada Inc.
7. The British Columbia Drug and Poison Information Centre, Poison Managements Manual, Canadian Pharmaceutical Association, Ottawa, 1981.
8. NFPA 325M Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, 1994 Edition, Quincy, MA, 1994.

The information contained herein is offered only as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Brenntag Canada Inc. will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein. This Material Safety Data Sheet is valid for three years.

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British Columbia: 20333-102B Avenue, Langley, BC, V1M 3H1
Phone: (604) 513-9009 Facsimile: (604) 513-9010

Alberta: 6628 - 45 th. Street, Leduc, AB, T9E 7C9
Phone: (780) 986-4544 Facsimile: (780) 986-1070

Manitoba: 681 Plinquet Street, Winnipeg, MB, R2J 2X2
Phone: (204) 233-3416 Facsimile: (204) 233-7005

Ontario: 43 Jutland Road, Toronto, ON, M8Z 2G6
Phone: (416) 259-8231 Facsimile: (416) 259-5333

Quebec: 2900 Jean Baptiste Des., Lachine, PQ, H8T 1C8
Phone: (514) 636-9230 Facsimile: (514) 636-0877

Atlantic: A-105 Akerley Boulevard, Dartmouth, NS, B3B 1R7
Phone: (902) 468-9690 Facsimile: (902) 468-3085

Prepared By: Regulatory Affairs Group, Brenntag Canada Inc., (416) 259-8231.

SAFETY DATA SHEET



Haifa Phosphoric acid

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Complying with 1907/2006/EEC Regulation of 18 December 2006 ("REACH Regulation") and REGULATION (EC) No 1272/2008 (CLP)

Section 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier

Product name: Phosphoric Acid 75%, 80% and 85%

Trade names: Phosphoric Acid 75%, 80% and 85%; Multy-P

Synonyms: Orthophosphoric acid; Phosphoric acid (aqueous); White phosphoric acid

Chemical formula: H₃PO₄

Fertilizer formula: 0-61-0

Product type: Liquid

CAS number: 7664-38-2

EC number: 231-633-2

REACH registration no(s): 01-2119485924-24

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/preparation:

Agriculture- component of liquid fertilizers, pH adjuster, cleaner of irrigation system.

Food processing - acidifier, sequestrant, synergist for antioxidant.

Pharmacopoeia- processed aid (solvent), dental cement.

Industries- manufacture of inorganic phosphates, fertilizers, detergents, acid catalyst, metal treatment, water treatment.

1.3 Details of the supplier of the safety data sheet

Other Countries Importer

Supplier/Manufacturer:

Haifa Chemicals Ltd.

P.O.Box 15011, Matam-

Haifa, 31905, Israel

Tel: 972-74-7373737

Fax: 972-74-7373733

E-mail: Regulatory@haifa-group.com

E-mail address of person responsible for this SDS: Regulatory@haifa-group.com

1.4 Emergency telephone number

Emergency telephone number (with hours of operation): +972-74-7373737

CHEMTREC (U.S.): 1-800-424-9300

13.17 * per gal @ 25°C

Attachment #6

SAFETY DATA SHEET

Haifa Phosphoric acid

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Section 2. HAZARDS IDENTIFICATION**Classification in accordance to Regulation(EC) No. 1272/2008 (CLP/GHS)**

| Ingredient name | GHS Classification |
|-----------------|---|
| Phosphoric acid | Skin Corr. 1B; H314 Met. Corr. 1; H290 |

Classification according to Directive 67/548/EEC (DSD) or 1999/45/EC

| Ingredient name | EU Classification |
|-----------------|-------------------|
| Phosphoric acid | C; R34 |

See section 16 for full text of the R phrases or H statements declared above.
See section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Labeling in accordance with Regulation 1272/2008 (CLP)

Hazard pictograms:

**Signal word:** Danger**Hazard statements:**

H290: May be corrosive to metals.

H314: Causes severe skin burns and eye damage.

Precautionary Statements:

P260: Do not breathe mists

P280: Wear protective gloves, protective clothing, eye and face protection

P301+P330+P331: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting

P303+P361+P353: IF ON SKIN (or hair): Remove immediately all contaminated clothing. Rinse skin with water

P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P405: Store locked up

2.3 Other hazard**Substance meets the criteria for BBT according to Regulation (EC) No. 1907/2006, Annex XIII:**

Not applicable

Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII:

Not applicable

Other hazard which do not result in classification:

Not applicable

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Haifa Phosphoric acid

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Section 3. COMPOSITION/INFORMATION ON INGREDIENTS**Substance/preparation:**

| Product/ Ingredient name | Identifiers | % | EU Classification | CLP/GHS Classification |
|-----------------------------|--|----------|----------------------|---|
| Phosphoric acid | CAS number: 7664-38-2 EC number: 231-633-2 REACH: 01-2119485924-24 | 75/80/85 | C; R34 | Skin Corr. 1B; H314 Met. Corr. 1; H290 |
| Water | CAS number: 7732-18-5 EC number: 231-791-2 | Balance | Not classified | Not classified |

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in section 8.
See section 16 for the full text of the R-phrases and H-statements declared above.

Section 4. FIRST AID MEASURES**4.1 Description of first aid measures**

- Eyes contact:** In case of contact with eyes rinse opened eyes under running water for at least 15 minutes and seek medical advice.
- Skin contact:** In case of contact with skin wash off immediately with mild soap and plenty of water for at least 15 minutes, and seek medical advice.
- Inhalation:** Remove the casualty into fresh air and keep him calm. Apply artificial respiration if necessary and get medical attention immediately.
- Ingestion:** If large quantities of this material are swallowed, call a physician immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If victim is conscious give water to drink.

4.2 Most important symptoms and effects, both acute and delayed

Causes burns to respiratory tract, gastrointestinal tract, skin and eyes. May cause irritation to the nose, eyes, skin, throat and upper respiratory tract. In contact with skin may cause redness, pain and severe skin burns.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician: No specific antidote, medical staff contacts Poisons Information Center. All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Special treatments: No specific treatment

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Section 5: Fire-Fighting Measures

5.1 Extinguishing media

Suitable: Use an extinguishing agent suitable for surrounding fire.

Not suitable: N/A

5.2 Special hazards arising from the substance or mixture

Non-combustible.

Hazardous thermal decomposition products: Oxides of phosphorous.

5.3 Advice for firefighters

Special protective equipment for fire fighters: Fire-fighters should wear appropriate protective equipment and self contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Remark: Move containers from fire area if possible to do so without risk.

Section 6: Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Wear protective clothing. Ventilate area of spill. Avoid contact with skin and eyes. Avoid breathing vapors, mist or gas.

6.2 Environmental precautions

Avoid contact of spilt material and runoff with soil and surface waterways.

6.3 Methods and materials for containment and cleaning up

Absorb the chemical onto sand, vermiculite, or any other non-combustible absorbent, and collect into containers for later disposal.

Large spill: As for small spill

Personal Protection in Case of Large Spill: Safety glasses. Full suit. Dust respirator. Boots. Gloves. A self-contained breathing apparatus should be used to avoid inhalation of the product.

6.4 Reference to other sections

See Sections 1 for emergency contact information

See Section 8 for information on appropriate personal protective equipment

See Section 13 for additional waste treatment information

Section 7: Handling and Storage

7.1 Precautions for safe handling

Handling: Do not breathe vapors. Avoid contact with skin and eyes. Wash thoroughly after handling.

Hygiene Measures: Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also section 8 for additional information measures.

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7.2 Conditions for safe storage, including any incompatibilities

Storage: Keep containers tightly closed, in a dry, cool and well ventilated place. Protect from humidity. Do not store together with strong bases, metals and strong oxidizing agents. Keep away from heat.
Packaging materials recommended : Do not store in metal containers.

7.3 Specific end use(s): N/A

Section 8: Exposure Control / Personal Protection

8.1 Control parameters

Occupational exposure limit values:

| Ingredient name | Occupational exposure limits |
|-----------------|--|
| Phosphoric acid | ACGIH-TLV 1 mg/m ³ (TWA), 3 mg/m ³ (STEL) OSHA-PEL 1 mg/m ³ (TWA) GER-MAK 2 mg/m ³ (TWA), inhalable NIOSH-REL, 10H, 1 mg/m ³ (TWA), 3 mg/m ³ (STEL) |

Derived effects levels:

Recommended occupational and consumer exposure limit values (following from the preformed CSA):

| Exposure pattern | Derived No Effect Level (DNEL) | |
|------------------|------------------------------------|------------------------------------|
| | Workers | General population |
| Oral | N/A | N/A |
| Dermal | N/A | N/A |
| Inhalation | 2.92 mg/m ³ (long-term) | 0.73 mg/m ³ (long-term) |

8.2 Exposure controls

Engineering Measures

Use process enclosures, local exhaust ventilation, or others engineering controls to keep airborne levels below recommend exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Person Protective measures

Respiratory protection: Suitable respirator. Be sure to use an approved/certified or equivalent. Wear appropriate respirator when ventilation is inadequate.

Hand protection: Wear protective disposable gloves to prevent skin exposure. Material of gloves: Chloroprene, Neoprene or PVC.

Eye protection: Wear protective safety goggles.

Skin protection: Wear appropriate long-sleeved clothing to minimize skin contact.

Environmental exposure controls: Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

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Section 9: Physical and Chemical Properties**9.1 Information on basic physical and chemical properties**

Appearance: Liquid, colorless

Odour: Odourless

Odour threshold: Odourless

pH: <1 (Conc. (%w/w): 1) [Acidic]

Melting point/Freezing point: -20°C (-4°F)- 75% Phosphoric acid
0°C (32°F)- 80% Phosphoric acid
21°C (70°F)- 85% Phosphoric acid

Initial boiling point/boiling range: 135-158°C (275-316°F)

Flash point: Not applicable

Evaporation rate: <1; compared with butyl acetate (butyl acetate=1)

Flammability: Not flammable

Upper/lower flammability or explosive limits: N/A

Vapor pressure: 0.75 kPa (5.65 mm Hg) at 20°C (68°F)- 75% Phosphoric acid

0.29 kPa (2.16 mm Hg) at 20°C (68°F)- 85% Phosphoric acid

Vapor density: N/A

Relative Density: 1.573 g/ml at 25°C (77°F)- 75% Phosphoric acid

1.628 g/ml at 25°C (77°F)- 80% Phosphoric acid

1.685 g/ml at 25°C (77°F)- 85% Phosphoric acid

Solubility(ies): Water solubility- miscible

Partition coefficient Octanol/Water: Miscible in water

Auto-ignition temperature: Not applicable

Decomposition temperature: >158°C (316°F) – release of water, becomes polyphosphoric acids

Viscosity: Viscous liquid

Explosive properties: Not explosive

Oxidizing properties: Not oxidizer

9.2 Other information:

Molecular weight: 98.0 g/mol

VOC: Not an organic compounds

Miscibility: Miscible in water

Fat solubility: Not applicable

Conductivity: Not applicable

Gas group: Not applicable

Vapor composition: Pure water vapor up to about 300°C (572°F)

Vapors of water and phosphorous oxide at >300°C (572°F)

Section 10: Stability and Reactivity**10.1 Reactivity**

No specific test data related to reactivity available for this product or its ingredients

10.2 Chemical stability

The product is stable under normal handling and storage conditions described in Section 7.

10.3 Possibility of hazardous reactions

Reacts violently with strong bases. Contact with metals may release flammable hydrogen gas.

10.4 Conditions to avoid

Extreme humidity, excess heat.

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10.5 Incompatible materials

Metals, strong oxidizing agents and strong bases. Do not mix with solutions containing bleach or ammonia.

10.6 Hazardous Decomposition products

Under fire- Oxides of phosphorous at >300°C (572°F).

Section 11: Toxicological Information

11.1 Information on toxicological effects

Acute toxicity:

| Product/ingredient name | Test | Species | Dose |
|-------------------------|------------|--------------|--|
| Phosphoric acid | LD50, Oral | Rat (female) | 1.7 mL/100 g body weight (equivalent or similar to OECD Guideline 423) |

Skin corrosion/irritation: Corrosive substance category 1B.

Serious eye damage/irritation: Corrosive.

Respiratory or skin sensitization: N/A

Germ cell mutagenicity: Phosphoric acid was found to be negative in all available in vitro gene mutation tests and therefore, the substance should not be classified for mutagenicity.

Carcinogenicity: This product does not contain any substances that are considered by IARC, NTP, OSHA, EU or ACGIH to be "probable" or "suspected" human carcinogens.

Reproductive toxicity: Based on the available data and according to the criteria laid down in the CLP Regulation, phosphoric acid should not be classified for reproductive toxicity.

Specific target organ toxicity (single exposure): N/A

Specific target organ toxicity (repeated exposure): Oral (Rat): NOEL 250 mg/kg bw/day, OECD Guideline 422. Based on the available data for repeated dose toxicity via the oral route and according to the CLP criteria, phosphoric acid should not be classified for STOT - repeated exposure.

Aspiration hazard: N/A

Other effects:

Inhalation of product may aggravate existing chronic respiratory disease.

Over-exposure sign/symptoms:

Eyes contact: Adverse symptoms may include the following: Symptoms may include redness, pain, blurred vision, eye burns and permanent eye damage.

Inhalation: Symptoms may include irritation to the nose, throat and upper respiratory tract

Ingestion: Adverse symptoms may include the following:

Symptoms may include severe burns of the mouth, throat and stomach. Ingestion of large quantities may cause gastrointestinal irritation, vomiting and diarrhea.

Skin contact: Adverse symptoms may include the following: May cause redness, pain and severe skin burns.

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Toxicokinetics (absorption, metabolism, distribution and elimination): Phosphoric acid is not considered to have bioaccumulative potential as it is highly soluble in water and phosphate levels in the body are regulated via homeostasis.

Section 12: Ecological Information

12.1 Toxicity

| Substance name | Toxicity to crustaceans | Toxicity to algae |
|-----------------|--|---|
| Phosphoric acid | EC50 (48 h): > 100 mg/L test mat. (nominal) based on: immobilisation | EC50 (72 h): >100 mg/L test mat. (nominal) NOEC (72 h): 100 mg/L test mat. (nominal) |

12.2 Persistence and Degradability

Not applicable, since inorganic substance.

12.3 Bioaccumulative potential

Not relevant.

12.4 Mobility in soil

Phosphoric acid itself will not absorb to soil. In most cases it will dissociate to $(\text{PO}_4)^{3-}$ and H^+ ions in the soil pore water, and/or react with minerals present in the soil, in particular calcium, iron and aluminium. Except in very specific circumstances (acidic soils, certain mineral soil types, very high dosage of phosphoric acid) phosphoric acid will not therefore penetrate beyond the surface layer of soil and will not reach the groundwater table.

12.5 Results of PBT and vPvB assessment

The criteria for the identification of PBT/vPvB properties, as laid down in REACH Annex XIII do not apply to inorganic substances. This implies that phosphoric acid will not be identified as PBT or vPvB substances.

12.6 Other adverse effects

No sediment or terrestrial toxicity data exists. Substance is not considered to be hazardous to sediment dwelling or terrestrial organisms. Increases in phosphoric acid concentrations may result in a decreased pH which may have a detrimental local effect on organisms.

According to the criteria of the European classification and labelling system, the substance does not require classification as hazardous for the environment.

Section 13: Disposal Considerations

13.1 Waste treatment methods

Provisions relating to waste: Directive 2008/98/EC on waste, of 19 November, 2008: Depending on branch of industry and production process, also other EURAL codes may be applicable 06 03 14: solid salts and solutions other than those mentioned in 06 03 11 and 06 03 13

Product

Methods of disposal: Waste must be disposed of in accordance with federal, state and local environmental control regulations.

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Hazardous waste: N/A**Packing**

Empty containers should be taken for local recycling, recovery or waste disposal.

Section 14: Transport Information**International transport regulations****14.1 Un number**ADR/RID: 1805IMDG: 1805IATA: 1805**14.2 Proper shipping name**ADR/RID: PHOSPHORIC ACID, SOLUTIONIMDG: PHOSPHORIC ACID, SOLUTIONIATA: Phosphoric acid, solution**14.3 Transport hazard class(es)**ADR/RID: 8IMDG: 8IATA: 8**14.4 Packing group**ADR/RID: IIIIMDG: IIIIATA: III**14.5 Environmental hazard**ADR/RID: -IMDG: -IATA: -**14.6 Special precautions for user**

Not available

14.7 Transport to bulk according to Annex II of MARPOL 79/78 and the IBC Code

Not available

14.7 Transport to bulk according to Annex II of MARPOL 79/78 and the IBC Code

Not applicable

Section 15: Regulatory Information**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

EU Directives 67/548/EEC and 1999/45/EC (including amendments)

EU Regulation(EC) No.1907/2006 (REACH), No 1272/2008 (CLP)

15.2 Chemical safety assessment

In accordance with REACH article 14, a Chemical Safety Assessment has been carried out for this substance.

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Section 16: Other Information

Full text of R-phrases referred to in section 3:

C- corrosive
R34: Causes burns.

Full text of Hazards Statements referred to in section 3:

Skin Corr.- Skin corrosion
Met. Corr.- corrosive to metals
H290: May be corrosive to metals.
H314: Causes severe skin burns and eye damage.

Additional Precautionary statements:

P260: Do not breathe dust/fume/gas/mist/vapours/spray.
P264: Wash... thoroughly after handling.
P301+P330+P331: IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303+P361+P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P363: Wash contaminated clothing before reuse.
P304+P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P310: Immediately call a POISON CENTER or doctor/physician.
P321: Specific treatment (see... on this label).
P405: Store locked up.
P501: Dispose of contents/container to...

Training advice: Before using/handling the product one must read carefully present MSDS.

Recommended restriction: N/A

Key Legend Information:

ACGIH- American Conference of Governmental Industrial Hygienists
OSHA- Occupational Safety and Health Administration
NTP- National Toxicology program
IARC- International Agency for Research on Cancer
ND- Not Determined
N/A- Not available

R-phrases- Risk phrases

S-phrases- Safety phrases

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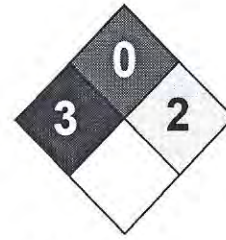
Version no. 6

To the best of our knowledge the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Attachment # 6



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| | |
|---------------------|---|
| Health | 3 |
| Fire | 0 |
| Reactivity | 2 |
| Personal Protection | |

Material Safety Data Sheet Sulfuric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sulfuric acid

Catalog Codes: SLS2539, SLS1741, SLS3166, SLS2371, SLS3793

CAS#: 7664-93-9

RTECS: WS5600000

TSCA: TSCA 8(b) inventory: Sulfuric acid

CI#: Not applicable.

Synonym: Oil of Vitriol; Sulfuric Acid

Chemical Name: Hydrogen sulfate

Chemical Formula: H₂-SO₄

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

| Name | CAS # | % by Weight |
|---------------|-----------|-------------|
| Sulfuric acid | 7664-93-9 | 95 - 98 |

Toxicological Data on Ingredients: Sulfuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]. VAPOR (LC50): Acute: 510 mg/m³ 2 hours [Rat.]. 320 mg/m³ 2 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged

contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion:

Products of combustion are not available since material is non-flammable. However, products of decomposition include fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

Fire Hazards in Presence of Various Substances: Combustible materials

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

Metal acetylides (Monocesium and Monorubidium), and carbides ignite with concentrated sulfuric acid. White Phosphorous + boiling Sulfuric acid or its vapor ignites on contact. May ignite other combustible materials. May cause fire when sulfuric acid is mixed with Cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phosphorous (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.

Special Remarks on Explosion Hazards:

Mixtures of sulfuric acid and any of the following can explode: p-nitrotoluene, pentasilver trihydroxydiaminophosphate, perchlorates, alcohols with strong hydrogen peroxide, ammonium tetraperoxychromate, mercuric nitrite, potassium chlorate, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbides, phosphorous, iodides, picratres, fulminats, dienes, alcohols (when heated) Nitramide decomposes explosively on contact with concentrated sulfuric acid. 1,3,5-Trinitrosohexahydro-1,3,5-triazine + sulfuric acid causes explosive decomposition.

Section 6: Accidental Release Measures**Small Spill:**

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage**Precautions:**

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:

Hygroscopic. Reacts. violently with water. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 1 STEL: 3 (mg/m3) [Australia] Inhalation TWA: 1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 1 (mg/m3) from NIOSH [United States] Inhalation TWA: 1 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Thick oily liquid.)

Odor: Odorless, but has a choking odor when hot.

Taste: Marked acid taste. (Strong.)

Molecular Weight: 98.08 g/mole

Color: Colorless.

pH (1% soln/water): Acidic.

Boiling Point:

270°C (518°F) - 340 deg. C Decomposes at 340 deg. C

Melting Point: -35°C (-31°F) to 10.36 deg. C (93% to 100% purity)

Critical Temperature: Not available.

Specific Gravity: 1.84 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 3.4 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:

Easily soluble in cold water. Sulfuric is soluble in water with liberation of much heat. Soluble in ethyl alcohol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability:

Conditions to Avoid: Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases. Always add the acid to water, never the reverse.

Incompatibility with various substances:

Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.

Corrosivity:

Extremely corrosive in presence of aluminum, of copper, of stainless steel(316). Highly corrosive in presence of stainless steel(304). Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product. Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, dehydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone+nitric acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile +water, Alcohols + hydrogen peroxide, ally compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium hydroxide, Ammonium triperchromate, Aniline, Bromate + metals, Bromine pentafluoride, n-Butyraldehyde, Carbides, Cesium acetylene carbide, Chlorates, Cyclopentanone oxime, chlorinates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulfate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitronaphthlene +

sulfur, Diisobutylene, p-dimethylaminobenzaldehyde, 1,3-Diazidobenzene, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorohydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, , Ethylenimine, Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptafluoride, Indane + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mesityl oxide, Mercury nitride, Metals (powdered), Nitromethane, Nitric acid + glycerides, p-Nitrotoluene, Pentasilver trihydroxydiaminophosphate, Perchlorates, Perchloric acid, Permanganates + benzene, 1-Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Picrates, Potassium tert-butoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + Potassium chloride, Potassium Permanganate + water, Propiolactone (beta)-, Pyridine, Rubidium acetylene carbide, Silver permanganate, Sodium, Sodium carbonate, sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thallium (I) azidodithiocarbonate, Zinc chlorate, Zinc Iodide, azides, carbonates, cyanides, sulfides, sulfites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetylides, Hydrogen gas is generated by the action of the acid on most metals (i.e. lead, copper, tin, zinc, aluminum, etc.). Concentrated sulfuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

Special Remarks on Corrosivity:

Non-corrosive to lead and mild steel, but dilute acid attacks most metals. Attacks many metals releasing hydrogen. Minor corrosive effect on bronze. No corrosion data on brass or zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2140 mg/kg [Rat.]. Acute toxicity of the vapor (LC50): 320 mg/m³ 2 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth.

Other Toxic Effects on Humans:

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities (musculoskeletal) in rabbits at a dose of 20 mg/m³ for 7 hrs.(RTECS) Teratogenicity: neither embryotoxic, fetotoxic, nor teratogenetic in mice or rabbits at inhaled doses producing some maternal toxicity

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis. Eye: Causes severe eye irritation and burns. May cause irreversible eye injury. Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the stomach, GI bleeding, edema of the glottis, necrosis and scarring, and sudden circulatory collapse(similar to acute inhalation). It may also cause systemic toxicity with acidosis. Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung edema. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and scanty urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth(changes in teeth and supporting structures - erosion, discoloration). Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart leisons), and respiratory system/lungs(pulmonary edema, lung damage), teeth (dental discoloration, erosion). Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Sulfuric acid may be placed in sealed container or absorbed in vermiculite, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sulfuric acid UNNA: 1830 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Illinois toxic substances disclosure to employee act: Sulfuric acid New York release reporting list: Sulfuric acid Rhode Island RTK hazardous substances: Sulfuric acid Pennsylvania RTK: Sulfuric acid Minnesota: Sulfuric acid Massachusetts RTK: Sulfuric acid New Jersey: Sulfuric acid California Director's List of Hazardous Substances (8 CCR 339): Sulfuric acid Tennessee RTK: Sulfuric acid TSCA 8(b) inventory: Sulfuric acid SARA 302/304/311/312 extremely hazardous substances: Sulfuric acid SARA 313 toxic chemical notification and release reporting: Sulfuric acid CERCLA: Hazardous substances.: Sulfuric acid: 1000 lbs. (453.6 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):

R35- Causes severe burns. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S30- Never add water to this product. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Fammability: 0

Reactivity: 2

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:

-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

Other Special Considerations: Not available.

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Last Updated: 05/21/2013 12:00 PM

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Strong Inorganic Acid Mists Containing Sulfuric Acid

CAS No. 7664-93-9 (Sulfuric acid)

Known to be human carcinogens

First listed in the *Ninth Report on Carcinogens* (2000)



Carcinogenicity

Strong inorganic acid mists containing sulfuric acid are *known to be human carcinogens* based on sufficient evidence of carcinogenicity from studies in humans.

Cancer Studies in Humans

Occupational exposure to strong inorganic acid mists containing sulfuric acid is specifically associated with laryngeal and lung cancer. Studies of one U.S. cohort of male workers in pickling operations in the steel industry found excesses of laryngeal cancer (approximately twofold) after adjustment for smoking and other potentially confounding variables (Steenland *et al.* 1988). A ten-year follow-up of this cohort also found a twofold excess of laryngeal cancer, consistent with the earlier findings (Steenland 1997). The same cohort showed an excess of lung cancer after adjustment for smoking and other potentially confounding variables (Steenland and Beaumont 1989). A nested case-control study of workers in a U.S. petrochemical plant found a dose-related increase in the risk of laryngeal cancer among workers exposed to sulfuric acid at moderate levels (odds ratio [OR] = 4.6; 95% confidence interval [CI] = 0.83 to 25.35) or high levels (OR = 13.4; 95% CI = 2.08 to 85.99) (Soskolne *et al.* 1984). A Canadian population-based case-control study also found a dose-related risk of laryngeal cancer for workers exposed to sulfuric acid mist, after controlling for tobacco and alcohol use and using only the most specific exposure scale (Soskolne *et al.* 1992). A similar Canadian population-based case-control study suggested an increased risk of lung cancer (oat-cell carcinoma) (Siemiątycki 1991).

Additional Information Relevant to Carcinogenicity

The manufacture of isopropyl alcohol by the strong-acid process, which uses sulfuric acid, has been classified by the International Agency for Research on Cancer as carcinogenic to humans, based on increased incidence of cancer of the paranasal sinuses in workers (IARC 1977). The carcinogenic activity of sulfuric acid is most likely related to the genotoxicity of low-pH environments, which are known to increase the rates of depurination of DNA and deamination of cytidine (IARC 1992a).

Cancer Studies in Experimental Animals

No adequate studies in experimental animals of the carcinogenicity of sulfuric acid or strong inorganic acid mists containing sulfuric acid have been reported in the literature.

Properties

Sulfuric acid is a strong acid that is a clear, colorless oily liquid at room temperature. Impure or spent sulfuric acid is a dark-brown to black liquid. Sulfuric acid is soluble in water and ethanol and is very corrosive (IARC 1992b). Physical and chemical properties of sulfuric acid are listed in the following table.

| Property | Information |
|--|--|
| Molecular weight | 98.1 ^a |
| Density | 1.8 g/cm ³ |
| Melting point | 10.31°C ^b |
| Boiling point | 290°C ^c |
| Log K_{ow} | 1.92 ^b |
| Vapor pressure | 5.93×10^{-5} mm Hg at 25°C ^c |
| Vapor density relative to air | 3.4 ^a |
| Dissociation constant (pK _a) | 1.98 at 25°C ^c |

Sources: ^aHSDB 2009, ^bATSDR 1998.

A mist is defined as a liquid aerosol formed by condensation of a vapor or by atomization of a liquid. Strong inorganic acid mists containing sulfuric acid may be generated during a process when factors such as evaporation, solution strength, temperature, and pressure combine to result in release of a mist (IARC 1992a). Sulfuric acid mists are the most extensively studied of the acid mists. Liquid sulfuric acid may exist in air as a vapor or a mist; however, it exists most often as mist because of its low volatility and high affinity for water.

Acid strength is based on the position of equilibrium in an acid-base reaction and is measured by the negative logarithm (to the base 10) of the acid dissociation constant (pK_a). The lower the pK_a, the stronger the acid. Sulfuric acid has two pK_a values because it releases two hydrogen atoms in aqueous solution, but the first pK_a cannot be measured accurately and is reported as less than 0. Dehydration occurs because sulfuric acid has a strong affinity for water. It forms various hydrates when in contact with organic matter or water vapor. Although it is miscible with water, contact with water generates heat and may produce a violent reaction. The reaction with water releases toxic and corrosive fumes and mists. Sulfuric acid is noncombustible, but it can release flammable hydrogen gas when in contact with metals. Thermal decomposition to sulfur trioxide and water occurs at 340°C. Sulfuric acids are available in the following grades: commercial, electrolyte (high purity), textile (low organic content), and chemically pure or reagent grades (IARC 1992b, ATSDR 1998, HSDB 2009).

Sulfur trioxide is added to sulfuric acid to produce fuming sulfuric acid (also known as oleum). Oleum has a molecular weight of 178.1, may contain up to 80% free sulfur trioxide, and is a colorless to slightly colored oily liquid. Sulfur trioxide has a molecular weight of 80.1 and can exist as a gas, liquid, or solid. Liquid sulfur trioxide is colorless and fumes in air at ambient conditions. In the presence of moisture, sulfur trioxide forms solid polymers consisting of alpha and beta forms. The melting points of the alpha (62.3°C) and beta (32.5°C) forms are the temperatures at which they depolymerize back to the liquid form. The liquid form has a boiling point of 44.8°C and a density of 1.92 g/cm³ at 20°C. Both oleum and sulfur trioxide react with water and water vapor to form sulfuric acid mists. Oleum is available in several grades with free sulfur trioxide content ranging from 20% to 99.9% and corresponding sulfuric acid equivalents ranging from 104.5% to 122.5%. Sulfur trioxide is available with a minimum purity of 99.5% as a stabilized technical grade or unstabilized liquid (IARC 1992b).

Use

Strong inorganic acid mists containing sulfuric acid are not used *per se* in industry or in commercial products but are generated from both natural and industrial sources. In particular, sulfuric acid mists may be produced during the manufacture or use of sulfuric acid, sulfur trioxide, or oleum. Sulfur trioxide is primarily used to make sulfuric acid, but it is also used as a sulfonating or oxidizing agent. Oleum is used as a sulfonating or dehydrating agent, in petroleum refining, and as a laboratory reagent. Sulfuric acid is one of the most widely used industrial chemicals; however, most of it is used as a reagent

Attached mist # 17

rather than an ingredient. Therefore, most of the sulfuric acid used ends up as a spent acid or a sulfate waste. Exacting purity grades are required for use in storage batteries and for the rayon, dye, and pharmaceutical industries. Sulfuric acids used in the steel, chemical, and fertilizer industries have less exacting standards (IARC 1992b, ATSDR 1998, HSDB 2009).

Sulfuric acid is used in the following industries: fertilizer, petroleum refining, mining and metallurgy, ore processing, inorganic and organic chemicals, synthetic rubber and plastics, pulp and paper, soap and detergents, water treatment, cellulose fibers and films, and inorganic pigments and paints. Between 60% and 70% of the sulfuric acid used in the United States is used by the fertilizer industry to convert phosphate rock to phosphoric acid. All other individual uses account for less than 1% to less than 10% of the total consumption. Sulfuric acid use is declining in some industries. There is a trend in the steel industry to use hydrochloric acid instead of sulfuric acid in pickling, and hydrofluoric acid has replaced sulfuric acid for some uses in the petroleum industry. The primary consumer product that contains sulfuric acid is the lead-acid battery; however, this accounts for a small fraction of the overall use. Sulfuric acid is also used as a general-purpose food additive (IARC 1992b, ATSDR 1998).

Production

Strong inorganic acid mists containing sulfuric acid may be produced as a result of the use of mixtures of strong inorganic acids, including sulfuric acid, in industrial processes such as acid treatment of metals, phosphate fertilizer manufacture, and lead battery manufacture (IARC 1992b). The degree of vapor or mist evolution varies with the process and method. In pickling, for instance, mist may escape from acid tanks when hydrogen bubbles and steam rise from the surface of the solution.

Sulfuric acid is the largest-volume chemical produced in the United States (CEN 1996). Annual production increased from 28.3 million metric tons (62.4 billion pounds) in 1972 to 40.1 million metric tons (88.4 billion pounds) in 1980 (IARC 1992b, ATSDR 1998). Between 1981 and 2002, annual production remained fairly steady, ranging from a low of 32.6 million metric tons (71.9 billion pounds) in 1986 (IARC 1992b) to a high of 44 million metric tons (97 billion pounds) in 1998 (CEN 2003). Between 1992 and 2002, annual production declined by only 1% (CEN 2003). Many different grades and strengths of sulfuric acid are produced. The primary method of production is the contact process, which consists of the following steps: (1) oxidation of sulfur to sulfur dioxide, (2) cooling of the gases, (3) oxidation of sulfur dioxide to sulfur trioxide, (4) cooling of the sulfur trioxide gas, and (5) addition of sulfur trioxide to water to produce sulfuric acid. Oleum is produced at sulfuric acid plants by adding sulfur trioxide to sulfuric acid. In addition to primary production, large quantities of spent sulfuric acid are reprocessed (IARC 1992b, ATSDR 1998). In 2009, sulfuric acid was available from 76 U.S. suppliers, and oleum from 6 U.S. suppliers (ChemSources 2009).

The United States is a net importer of sulfuric acid and oleum. U.S. imports were 275,000 metric tons (600 million pounds) in 1975, 426,000 metric tons (940 million pounds) in 1984, and 2.3 million metric tons (5 billion pounds) in 1993, and exports were 129,000 metric tons (284 million pounds) in 1975, 119,000 metric tons (262 million pounds) in 1984, and 136,000 metric tons (300 million pounds) in 1993 (HSDB 2009). In 2009, imports were about 5 million kilograms (11 million pounds), and exports were 262,000 kg (578,000 lb) (USITC 2009).

Exposure

Human exposure to strong inorganic acid mists containing sulfuric acid may occur by inhalation, ingestion, or dermal contact. Exposure depends on many factors, including particle size, proximity to the source, and control measures such as ventilation and containment. Data on particle size distribution of acid mists are limited, and sampling methods have generally not differentiated between liquid and gaseous forms of acids. One study of sulfuric acid mists in several U.S. battery manufacturing plants found that particles had a mass median aerodynamic diameter of 5 to 6 μm , which indicates that sulfuric acid mists contain aerosol particles that can be deposited in both the upper and lower airways (IARC 1992a).

Sulfuric acid and mists and vapors containing sulfuric acid are present in the environment because of releases of sulfur compounds from both natural and anthropogenic sources. Volcanic eruptions, biogenic gas emissions, and oceans are the primary natural sources of sulfur emissions. Volcanoes release 0.75 million to 42 million metric tons (1.7 billion to 93 billion pounds) of sulfur per year, and airborne sea spray and marine organisms release between 12 million and 15 million metric tons per year (26 billion to 33 billion pounds). Coal combustion by electric plants is the major anthropogenic source of sulfur dioxide release. Sulfur dioxide emissions in the United States declined by more than 60% from the early 1970s (28 million metric tons [62 billion pounds]) to 1994 (18 million metric tons [40 billion pounds]) and decreased by another 13% from 1994 to 1995 (ATSDR 1998).

According to the U.S. Environmental Protection Agency's Toxics Release Inventory, environmental releases of sulfuric acid fluctuated from year to year, but remained in the range of 26 million to 197 million pounds from 1994 and 2007. In 2007, 840 facilities released over 138.5 million pounds of sulfuric acid, of which over 99% was released to air (TRI 2009). Ambient air may contain particulate-associated mixtures of sulfuric acid and ammonium sulfates (sulfuric acid partially or completely neutralized by atmospheric ammonia). The relative amounts of sulfuric acid and total sulfates depend on meteorological and chemical parameters. The presence of sulfuric acid and sulfates in the atmosphere is believed to be due to oxidation of sulfur dioxide in cloud water and other atmospheric media. Ambient-air concentrations of sulfuric acid are at least an order of magnitude lower than concentrations in occupational settings (IARC 1992a).

The industries in which occupational exposure to strong acid mists may occur include chemical manufacture (sulfuric acid, nitric acid, synthetic ethanol, and vinyl chloride), building and construction, manufacture of lead-acid batteries, manufacture of phosphate fertilizers, pickling and other acid treatments of metals, manufacture of petroleum and coal products, oil and gas extraction, printing and publishing, manufacture of paper and allied products, and tanneries. Most of the available occupational exposure data comes from the pickling and plating industries. In the 1970s and 1980s, average concentrations of strong inorganic acid mists containing sulfuric acid in workplace air were less than 0.01 to 7.3 mg/m^3 for pickling and acid cleaning, less than 0.07 to 0.57 mg/m^3 for phosphate fertilizer manufacture, 0.01 to 1.03 mg/m^3 for lead battery manufacture, and less than 0.005 to 0.5 mg/m^3 for other industries (IARC 1992a).

The National Occupational Hazard Survey (conducted from 1972 to 1974) estimated that 499,446 workers were exposed to sulfuric acid, 824,985 to hydrochloric acid, 132,401 to nitric acid, and 454,920 to phosphoric acid (NIOSH 1976). The National Occupational Exposure Survey (conducted from 1981 to 1983), which reported on more than 54,500 plants with potential workplace exposure to strong inorganic acids, estimated that 775,587 workers, including 173,653 women, potentially were exposed to sulfuric acid; 1,238,572 workers,

including 388,130 women, to hydrochloric acid; 297,627 workers, including 76,316 women, to nitric acid; and 1,256,907 workers, including 450,478 women, to phosphoric acid (NIOSH 1990).

Regulations

Coast Guard, Department of Homeland Security

Minimum requirements have been established for safe transport of sulfuric acid on ships and barges
Consumer Product Safety Commission (CPS)

Sulfuric acid and any preparation containing sulfuric acid in a concentration of 10% or more must have a label containing the word "poison"

Department of Transportation (DOT)

Sulfuric acid and numerous sulfuric acid mixtures are considered hazardous materials and special requirements have been set for marking, labeling and transporting these materials

Environmental Protection Agency (EPA)

Clean Air Act

New Source Performance Standards Standards of performance have been established for sulfuric acid production units including all units on acid mist (e.g., SO₂ emissions of 0.1 lb/ton of acid produced)

Clean Water Act

Sulfuric acid is designated as a hazardous substance

Comprehensive Environmental Response, Compensation, and Liability Act
Reportable quantity 1,100 lb for sulfuric acid

Emergency Planning and Community Right-To-Know Act

Toxic Release Inventory Local forms of sulfuric acid are listed and thus subject to reporting requirements

Threshold planning quantity 1,100 lb for sulfuric acid
Reportable quantity 1,100 lb for sulfuric acid

Resource Conservation and Recovery Act

Listed hazardous waste site access for which the listing is based wholly or partly on the presence of sulfuric acid 10,111

Occupational Safety and Health Administration (OSHA)

Health hazard accurately identified as a health hazard if it is a health hazard in OSHA's hazard identification studies and may not adequately protect workers
Permissible exposure limit 1 mg/m for sulfuric acid

Guidelines

American Conference of Governmental Industrial Hygienists (ACGIH)

Threshold limit value-time weighted average 0.05 mg/m for sulfuric acid contained in strong inorganic acid mists

National Institute for Occupational Safety and Health (NIOSH)

Recommended permissible limit 1 mg/m for sulfuric acid
Immediately dangerous to life and health limit 1.1 mg/m for sulfuric acid

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Effectiveness of Squid Hydrolysate as a Home Lawn Fertilizer

1. Joseph C. Fetter and
2. Rebecca N. Brown¹

1. *Department of Plant Sciences and Entomology, The University of Rhode Island, Plant Sciences, 210 Woodward Hall, Kingston, RI 02881*

1. José A. Amador

± Author Affiliations

1. *Department of Natural Resources Science, The University of Rhode Island, Plant Sciences, 210 Woodward Hall, Kingston, RI 02881*

Abstract

Consumer demand for cleaned squid generates a substantial amount of waste that must be properly disposed of, creating an economic burden on processors. A potential solution to this problem involves converting squid byproducts into an organic fertilizer, for which there is growing consumer demand. Organic fertilizers are reputed to offer advantages that synthetic fertilizers cannot provide, such as increasing soil water- and nutrient-holding capacity and promoting the growth of beneficial soil organisms. To evaluate the effectiveness of hydrolyzed squid waste as an organic fertilizer, we quantified soil fertility and turfgrass quality on perennial ryegrass turf (*Lolium perenne* L.) amended with two types of fertilizer: squid-based (SQ) or synthetic (SY). Field plots were established on an Enfield silt loam in Kingston, RI, and liquid (L) or granular (G) fertilizer formulations of squid or synthetic fertilizers were applied at 0, 48, 146, and 292 kg nitrogen/ha/year. Soil physical, chemical, and biological properties were determined monthly and turfgrass quality was determined periodically during the growing season in 2008 and 2009. Squid hydrolysate applied as a liquid (SQL) and granular (SQG) fertilizer consistently provided high-quality, uniform turf when compared with synthetic fertilizer applied at the same rate. Soil concentrations of NO₃, NH₄, PO₄, pH, moisture, soil organic matter, C:N ratio, and levels of trace metals were unaffected by fertilizer type, formulation, or rate throughout the two-year study. Both squid-based organic fertilizer formulations gave significantly higher microbial activity rates than their synthetic counterparts regardless of application rate. Conversion of squid processing byproducts into fertilizer has the potential to improve turfgrass quality while providing a sustainable solution to waste disposal problems in the seafood processing industry.