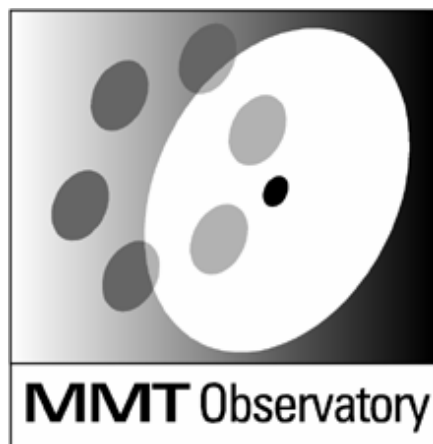


MMTO Internal Technical Memorandum #05-2



Smithsonian Institution &
The University of Arizona®

Hazardous Chemical Procedures at MMT Observatory

— Initial Release —

Version of June 27, 2005

W. Kindred

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Hazardous Chemical Procedures at MMT Observatory

William Kindred
MMT Observatory
June 27, 2005

I. Introduction

The process of depositing aluminum on the 6.5m primary mirror requires use of several chemicals that are potentially hazardous to health and environment. Presented here are outlines of the potential hazards and procedures for employee protection, spill management, and waste disposal.

II. Chemicals

The following chemicals are used in the coating process:

- Liqui-Nox Detergent.
- Acetone ((CH₃)₂CO).
- Isopropyl Alcohol ((CH₃)₂CHOH).
- Calcium Carbonate (CaCO₃).
- Cupric Sulphate (CuSO₄).
- Hydrochloric Acid (37%) (HCl).
- Nitric Acid (70%) (HNO₃).
- Phosphoric Acid (75%) (H₃PO₄).
- Potassium Hydroxide (KOH).

III. Health and Safety (see MSDS for more detailed information)

- **Liqui-Nox** is a phosphate free, biodegradable anionic liquid detergent from Alconox Inc. There are no special safety or health hazards.
- **Acetone** is a flammable and somewhat aromatic ketone organic solvent. Care must be exercised when used in the vicinity of ignition sources. Prolonged inhalation of vapors is harmful and skin irritation can result from repeated exposure.
 - 1) Eye protection: highly recommended.
 - 2) Skin protection: highly recommended—poly or nitrile.
 - 3) Clothing protection: highly recommended.
 - 4) Respiration protection: organic vapor mask highly recommended—required in poorly ventilated areas or for prolonged periods.
 - 5) Spill:
 - a) Soak up with available absorbents or towels and remove from work area.
 - b) Ventilate work area.
 - 6) Fire: Acetone fires may be controlled with carbon dioxide, alcohol foam or dry chemical extinguishers.

- **Isopropyl Alcohol** or Isopropanol is a flammable, monohydric alcohol. Care must be exercised when used in the vicinity of ignition sources. Inhalation of vapors can be harmful and minor skin irritation can result from repeated exposure.
 - 1) Eye protection: highly recommended.
 - 2) Skin protection: highly recommended—poly, nitrile or latex.
 - 3) Clothing protection: recommended.
 - 4) Respiration protection: organic vapor mask recommended—required in poorly ventilated areas or for prolonged periods.
 - 5) Spill:
 - a) Soak up with available absorbents and remove from work area
 - b) Ventilate work area.
 - 6) Fire: Isopropanol fires may be controlled with water, carbon dioxide, alcohol foam or dry chemical extinguishers.

- **Calcium Carbonate** (CaCO_3) is an alkaline powder of low toxicity.
 - 1) Eye protection: recommended.
 - 2) Skin protection: recommended—poly, nitrile or latex.
 - 3) Clothing protection: recommended.
 - 4) Respiration protection: particle mask recommended.
 - 5) Spill:
 - a) Scoop then vacuum—use particle mask.
 - b) Ventilate work area.
 - 6) Fire: not a fire hazard.

- **Cupric Sulphate** is a blue, odorless crystalline solid.
 - 1) Eye protection: required.
 - 2) Skin protection: recommended—poly, nitrile or latex.
 - 3) Clothing protection: recommended.
 - 4) Respiration protection: particle mask required.
 - 5) Spill: Scoop then vacuum—use particle mask.
 - 6) Fire: not a fire hazard.

- **Hydrochloric Acid** is a highly corrosive, non-oxidizing acid. Contact with skin, eyes, and clothing **MUST** be avoided. Inhalation of vapors, especially of the concentrate, **MUST** be avoided.
 - 1) Eye protection: required.
 - 2) Skin protection: required—poly or nitrile.
 - 3) Clothing protection: required—Tyvek.
 - 4) Respiration protection: acid gas mask required with concentrate, highly recommended with dilute solution.
 - 5) Spill:
 - a) Evacuate work area **IMMEDIATELY**.
 - b) Cleanup personnel **MUST** wear respiration protection, eye, skin, and clothing protection.
 - c) Pour neutralizer around the perimeter of the spill, then inward until completely covered.

- d) After bubbling has stopped, scoop a small amount into a beaker and dilute with water. Measure Ph with litmus paper. Ph should be in the range of 6.5-7.5. Adjust with neutralizer as necessary.
 - e) Scoop the neutralized product into a high-density polyethylene (HDPE) container and label “neutralized hydrochloric acid.”
 - f) Have protected personnel swab the entire area with paper towels to ensure no pockets of liquid remain.
 - g) Ventilate work area thoroughly.
 - h) Notify supervisory personnel ASAP.
 - 6) Fire: While not flammable, hydrochloric acid can evolve flammable hydrogen gas and toxic reaction products when heated. In the event of fire that might involve hydrochloric acid, respiration protection **MUST** be worn and the area evacuated until thoroughly ventilated and any possible spills contained and neutralized.
- **Nitric Acid (70%)** is a strong monobasic acid and oxidant. Contact with skin, eyes, and clothing **MUST** be avoided. Inhalation of vapors, especially of the concentrate, **MUST** be avoided.
 - 1) Eye protection: required.
 - 2) Skin protection: required—poly or nitrile.
 - 3) Clothing protection: required—Tyvek.
 - 4) Respiration protection: acid gas mask required with concentrate, highly recommended with dilute solution.
 - 5) Spill:
 - a) Evacuate work area **IMMEDIATELY**.
 - b) Cleanup personnel **MUST** wear respiration protection, eye, skin, and clothing protection.
 - c) Pour neutralizer around the perimeter of the spill, then inward until completely covered.
 - d) After bubbling has stopped, scoop a small amount into a beaker and dilute with water. Measure Ph with litmus paper. Ph should be in the range of 6.5-7.5. Adjust with neutralizer as necessary.
 - e) Scoop the neutralized product into an HDPE container and label “neutralized nitric acid.”
 - f) Have protected personnel swab the entire area with paper towels to ensure no pockets of liquid remain.
 - g) Ventilate work area thoroughly.
 - h) Notify supervisory personnel ASAP.
 - 6) Fire: While not flammable, nitric acid can give off very toxic vapors and reaction products when heated. In the event of fire that might involve nitric acid, respiration protection **MUST** be worn and the area evacuated until thoroughly ventilated and any possible spills contained and neutralized.
- **Phosphoric Acid (75%)** is an oily, thick, colorless, and odorless acid. It is weak relative to the other acids. Contact with skin, eyes, and clothing **MUST** be avoided. Inhalation of vapors and mists, especially of the concentrate, **MUST** be avoided.
 - 1) Eye protection: required.
 - 2) Skin protection: required—poly or nitrile.

- 3) Clothing protection: required—Tyvek.
 - 4) Respiration protection: acid gas mask required with concentrate, highly recommended with dilute solution. Phosphoric acid is generally considered an inhalation hazard only when in mist form or when heated but given the serious implications of inhalation, protection is prudent.
 - 5) Spill:
 - a. Evacuate work area **IMMEDIATELY**.
 - b. Cleanup personnel **MUST** wear respiration protection, eye, skin, and clothing protection.
 - c. Pour neutralizer around the perimeter of the spill, then inward until completely covered.
 - d. After bubbling has stopped, scoop a small amount into a beaker and dilute with water. Measure Ph with litmus paper. Ph should be in the range of 6.5-7.5. Adjust with neutralizer as necessary.
 - e. Scoop the neutralized product into an HDPE container and label “neutralized phosphoric acid.”
 - f. Have protected personnel swab the entire area with paper towels to ensure no pockets of liquid remain.
 - g. Ventilate work area thoroughly.
 - h. Notify supervisory personnel ASAP.
 - 6) Fire: While not flammable, phosphoric acid can react with most metals and produce flammable hydrogen gas. In the event of fire that might involve phosphoric acid, respiration protection **MUST** be worn and the area evacuated until thoroughly ventilated and any possible spills contained and neutralized.
- **Potassium Hydroxide** is an extreme caustic that will cause severe burns to eyes, skin, respiratory and gastrointestinal tracts. The concentrate comes in pellet form. Contact with skin, eyes, and clothing **MUST** be avoided. Inhalation of vapors and dust **MUST** be avoided.
 - 1) Eye protection: required.
 - 2) Skin protection: required—poly, nitrile or latex.
 - 3) Clothing protection: required with dilute solution, recommended with pellets—Tyvek
 - 4) Respiration protection: particle mask required while handling pellets, organic vapor mask recommended with dilute solution.
 - 5) Spill:
 - a. Evacuate work area **IMMEDIATELY**.
 - b. Cleanup personnel **MUST** wear respiration protection, eye, skin, and clothing protection.
 - c. Pour base neutralizer around the perimeter of the spill, then inward until completely covered.
 - d. After bubbling has stopped, scoop a small amount into a beaker and dilute with water. Measure Ph with litmus paper. Ph should be in the range of 6.5-7.5. Adjust with neutralizer as necessary.
 - e. Scoop the neutralized product into an HDPE container and label “neutralized potassium hydroxide.”
 - f. Have protected personnel swab the entire area with paper towels to ensure no pockets of liquid remain.

- g. Ventilate work area thoroughly.
 - h. Notify supervisory personnel ASAP.
- 6) Fire: While not flammable, potassium hydroxide can react with most metals and produce flammable hydrogen gas. In the event of fire that might involve potassium hydroxide, respiration protection **MUST** be worn and the area evacuated until thoroughly ventilated and any possible spills contained and neutralized.

Note on spill procedures. When soda ash (acid neutralizer) is poured on liquid concentrated acid, a very energetic reaction occurs. Heat is released and can cause splatters that can project droplets a considerable distance. Everyone in the vicinity of a cleanup MUST be fully protected. It is better to apply the neutralizer in stages and wait for the bubbling to subside rather than dump it all on at once.

IV. General Procedures

The greatest safety risks occur while mixing the acid and base solutions. **BOTTLES OF ACID CONCENTRATE MUST BE HANDLED WITH THE UTMOST CAUTION.** Full protective gear must be worn and spill mitigation procedures prepared for in advance. Eye-wash kits must be on hand.

1) PREPARING ALUMINUM STRIPPER

- a. Prepare work area: Clear adequate space and ensure isolation from other work activities. Ensure adequate ventilation (this is best done outside). Ensure that participating personnel are adequately and appropriately protected. Put neutralizing chemicals (soda ash) and waste containers (3.5 gallon poly buckets with lids—available from stores) in ready reach. Review spill procedures with participating personnel.
- b. Place a 5-gallon HDPE jerrycan in a HDPE containment tray.
- c. Label the jerrycan “**aluminum stripper: hydrochloric acid, cupric sulphate—10%.**”
- d. Add approximately 3.5 gallons of water.
- e. Add 2.5 liter of 37% HCl (ALWAYS add acid to water and NOT the reverse!).
- f. Add ¼ kg of Cupric Sulphate crystals.
- g. Add water to full—it is not necessary to agitate.
- h. Cap the jerrycan hand tight, then back off ¼ turn—it is not wise to tightly cap any recently-mixed chemical concoction: chemical reactions often produce heat and evolve gas in sufficient quantities to create a potential explosion hazard in closed containers.
- i. Five gallons might be adequate but ten is likely needed.

2) PREPARING POTASSIUM HYDROXIDE SOLUTION

- a. Prepare work area: Clear adequate space and ensure isolation from other work activities. Ensure adequate ventilation (this is best done outside). Ensure that participating personnel are adequately and appropriately protected. Put neutralizing chemicals (dry acid) and waste containers (3.5 gallon poly buckets with lids—available from stores) in ready reach. Review spill procedures with participating personnel.
- b. Place a 5-gallon HDPE jerrycan in a HDPE containment tray.
- c. Label the jerrycan “**potassium hydroxide solution.**”
- d. Add water to nearly full.
- e. Add ½ kg of KOH crystals.

- f. Add water to full—it is not necessary to agitate.
- g. Cap the jerrycan hand tight, then back off ¼ turn.
- h. Ten gallons might be adequate but fifteen is likely needed.

3) PREPARING NITRIC ACID SOLUTION

- a. Prepare work area: Clear adequate space and ensure isolation from other work activities. Ensure adequate ventilation (this is best done outside). Ensure that participating personnel are adequately and appropriately protected. Put neutralizing chemicals (soda ash) and waste containers (3.5 gallon poly buckets with lids—available from stores) in ready reach. Review spill procedures with participating personnel.
- b. Place a 5-gallon HDPE jerrycan in a HDPE containment tray.
- c. Label the jerrycan “**nitric acid—20%.**”
- d. Add 3.5 gallon of water.
- e. Add 2.5 liter of nitric acid (70%) (ALWAYS add acid to water and NOT the reverse!).
- f. Add water to full—it is not necessary to agitate.
- g. Cap the jerrycan hand tight, then back off ¼ turn.
- h. Five gallons will be adequate.

4) PREPARING FILAMENT ETCHANT

- a. Prepare work area: Clear adequate space and ensure isolation from other work activities. Ensure adequate ventilation (this is best done outside). Ensure that participating personnel are adequately and appropriately protected. Put neutralizing chemicals (soda ash) and waste containers (3.5 gallon poly buckets with lids—available from stores) in ready reach. Review spill procedures with participating personnel.
- b. Place a 1-gallon HDPE bottle in a HDPE containment tray.
- c. Label the bottle “**acid etchant: phosphoric—80%, nitric—20%.**”
- d. Add phosphoric acid (75%) to 80% full.
- e. Add nitric acid (70%) to full—it is not necessary to agitate.
- f. Cap the bottle hand tight, then back off ¼ turn.
- g. One gallon is adequate for 200 filaments.

V. First Aid (First aid procedures are taken directly from the MSDS’s and compiled here for quick reference.)

ACETONE

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Aspiration hazard. If swallowed, vomiting may occur spontaneously, but **DO NOT INDUCE**. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact: Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

ISOPROPYL ALCOHOL

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact: Immediately flush skin with plenty of water for at least 15 minutes. Call a physician if irritation develops.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

CUPRIC SULPHATE

Inhalation: Remove victim from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Medical oxygen may be administered, if available, where breathing is difficult. Seek medical attention immediately.

Ingestion: If victim is conscious and can swallow, dilute stomach contents with 2 to 4 cupfuls of water or milk. **DO NOT INDUCE VOMITING.** Ingestion of cupric sulphate normally leads to spontaneous vomiting. When vomiting occurs naturally, rinse mouth and repeat administration of water. Seek medical attention immediately and bring a copy of this MSDS. Never give anything by mouth to an unconscious person.

Skin Contact: Remove contaminated clothing and wash affected area with soap and warm water. Seek medical attention if irritation persists or develops. Wash contaminated clothing before reuse.

Eye Contact: Immediately flush with warm, running water, including under the eyelids, for at least 15 minutes. Seek medical attention immediately.

HYDROCHLORIC ACID

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion: DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. 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. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

NITRIC ACID

Immediate first aid treatment reduces the health effects of this substance.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion: DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. 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. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

PHOSPHORIC ACID

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.

Ingestion: If swallowed, **DO NOT INDUCE VOMITING.** Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.

Eye Contact: Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

POTASSIUM HYDROXIDE

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion: If swallowed, **DO NOT INDUCE VOMITING.** Give large quantities of water. Never give anything by mouth to an unconscious person. 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. Wash clothing before reuse.

Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

VI. Waste Disposal

The runoff from the stripping/cleaning process (diluted with water by a factor of 15-25) is funneled through the primary mirror central perforation and collected in a 275 gallon, HDPE intermediate bulk container (IBC). This container has a metal reinforcing cage/pallet. Acidic and alkaline solutions are collected together and tend to neutralize each other although the residual tends to be a little basic simply because more of the potassium hydroxide solution is typically used than anything else.

Before disposal, pH of the residual should be checked (with litmus paper) and brought within the range of **6.5-7.5**. (pH, potential of the Hydrogen ion, is a measure of the acidity or alkalinity of a solution. A value of seven is neutral, more than seven is basic, and less than seven is acidic.)

To RAISE the pH, that is, to make the solution more basic (or less acidic), add soda ash (NaCO_3) and stir. To LOWER the pH or make the solution more acidic (or less basic), add dry acid (NaHSO_4) and stir. Adjust pH in this manner until it is within the acceptable limits.

The IBC's should be inspected before use to determine that there are no leaks and the HDPE skin is not cracking or showing signs of embrittlement. If there is any doubt about the integrity of the IBC, it should be replaced or used temporarily in a bulk containment system (a basin of suitable material (HDPE) capable of holding the entire contents of the IBC).

University of Arizona Department of Risk Management has determined that our waste, treated in this manner, is suitable for ground disposal. See letters in Appendix 3.

Leftover solutions should NOT be stored for the next cycle (typically three years). Dilute them with water and add to IBC to be neutralized as outlined above before disposal.

VII. Appendices

1. MSDS's

MSDS Number: A2705 * * * * * Effective Date: 08/10/04 * * * * * Supersedes: 11/02/01

MSDS	Material Safety Data Sheet	24 Hour Emergency Telephone: 908-859-2151
		CHEMTREC: 1-800-424-9300
		National Response in Canada
		CANUTEC: 613-996-6666
		Outside U.S. And Canada
		Chemtrec: 703-527-3887
		NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ALUMINUM METAL (WIRE, FOIL, SHOT)

1. Product Identification

Synonyms: Aluminum wire; Aluminum foil; Aluminum shot; Aluminum uncrated nonpyrophoric

CAS No.: 7429-90-5

Molecular Weight: 26.98

Chemical Formula: Al

Product Codes: 0449, 0456

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Aluminum Metal	7429-90-5	95 - 100%	Yes

3. Hazards Identification

Emergency Overview: As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

J.T. Baker SAF-T-DATA^(tm) Ratings

Health Rating: 0 - None

Flammability Rating: 1 - Slight

Reactivity Rating: 1 - Slight

Contact Rating: 0 - None

Lab Protective Equip: GOGGLES; LAB COAT

Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation: Not expected to be a health hazard.

Ingestion: Not expected to be a health hazard.

Skin Contact: No adverse effects expected.

Eye Contact: No adverse effects expected.

Chronic Exposure: No adverse effects expected.

Aggravation of Pre-existing Conditions: No adverse health effects expected.

4. First Aid Measures

Inhalation: Not expected to require first aid measures.

Ingestion: Not expected to require first aid measures.

Skin Contact: Not expected to require first aid measures.

Eye Contact: Not expected to require first aid measures.

5. Fire Fighting Measures

Fire: Not considered to be a fire hazard.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Special Information: Use protective clothing and breathing equipment appropriate for the surrounding fire.

6. Accidental Release Measures

Sweep, scoop or pick up spilled material. Package for reclamation or recovery. Package unreclaimable material for disposal in an approved waste disposal facility.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits: OSHA Permissible Exposure Limit (PEL): 15 mg/m³ (TWA) total dust and 5 mg/m³ (TWA) respirable fraction for Aluminum metal as Al

ACGIH Threshold Limit Value (TLV): 10 mg/m³ (TWA) Aluminum metal dusts

Ventilation System: In general, dilution ventilation is a satisfactory health hazard control for this substance. However, if conditions of use create discomfort to the worker, a local exhaust system should be considered.

Personal Respirators (NIOSH Approved): Not expected to require personal respirator usage.

Skin Protection: Wear protective gloves and clean body-covering clothing.

Eye Protection: Safety glasses.

9. Physical and Chemical Properties

Appearance: Bright, silver-white metal.

Odor: Odorless.

Solubility: Insoluble in water.

Density: 2.70

pH: No information found.

% Volatiles by volume @ 21C (70F): 0

Boiling Point: 2327C (4221F)

Melting Point: 660C (1220F)

Vapor Density (Air=1): No information found.

Vapor Pressure (mm Hg): 1 @ 1284C (2343F)

Evaporation Rate (BuAc=1): No information found.

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Toxic metal fumes may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Mercury, halocarbons, halogens, water (with bulk aluminum powder) strong oxidizing agents, some acids, bases and many other materials.

Conditions to Avoid: Incompatibles.

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

```
-----\Cancer Lists\-----  
-----  
Ingredient                                ---NTP Carcinogen---  
-----                                Known      Anticipated      IARC Category  
-----                                -----  
Aluminum Metal (7429-90-5)                No           No                None
```

12. Ecological Information

Environmental Fate: No information found.

Environmental Toxicity: No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

 Not regulated.

15. Regulatory Information

```
-----\Chemical Inventory Status - Part 1\-----  
Ingredient                                TSCA  EC   Japan  Australia  
-----                                -----  
Aluminum Metal (7429-90-5)                Yes   Yes  No     Yes
```

```
-----\Chemical Inventory Status - Part 2\-----  
Ingredient                                Korea  DSL  NDSL  Phil.  
-----                                -----  
Aluminum Metal (7429-90-5)                Yes   Yes  No    Yes
```

```
-----\Federal, State & International Regulations - Part 1\-----  
Ingredient                                -SARA 302-  -----SARA 313-----  
-----                                RQ    TPQ    List  Chemical Catg.  
-----                                -----  
Aluminum Metal (7429-90-5)                No     No    Yes   No
```

```
-----\Federal, State & International Regulations - Part 2\-----  
Ingredient                                CERCLA  -RCRA-  -TSCA-  
-----                                ----- 261.33  8 (d)  
-----                                -----  
Aluminum Metal (7429-90-5)                No     No     No
```

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: No Chronic: No Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: None allocated.

Poison Schedule: None allocated.

WHMIS: This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **0** Flammability: **0** Reactivity: **0**

Label Hazard Warning: As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes and clothing.

Label Precautions: None.

Label First Aid: Not applicable.

Product Use: Laboratory Reagent.

LIQUINOX

SECTION 1 : MANUFACTURER INFORMATION

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.

Supplier MSDS date: 2005/02/24

D.O.T. Classification: Not regulated.

SECTION 2 : HAZARDOUS INGREDIENTS

C.A.S: 25155-30-0

CONCENTRATION (%): 10-30

Ingredient Name: SODIUM DODECYLBENZENESULFONATE

T.L.V: NOT AVAILABLE

LD/50: 438 MG/KG RAT ORAL, 1330 MG/KG MOUSE ORAL

LC/50: NOT AVAILABLE

SECTION 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Liquid.

Appearance & odor: Odourless. Pale yellow.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): @ 20°C (68°F) 17

Vapour density (air=1): >1

Volatiles (%) By volume: Not available.

Evaporation rate (butyl acetate = 1): < 1.

Boiling point (°C): 100 (212F)

Freezing point (°C): Not available.

pH: 8.5

Specific gravity @ 20 °C: (water = 1). 1.083

Solubility in water (%): Complete.

Coefficient of water\oil dist.: Not available.

VOC: None

SECTION 4 : FIRE AND EXPLOSION HAZARD DATA

Flammability: Not flammable.

Conditions of flammability: Surrounding fire.

Extinguishing media: Carbon dioxide, dry chemical, foam, water, water fog.

Special procedures: Self-contained breathing apparatus required. Firefighters should wear the usual protective gear. Use water spray to cool fire exposed containers.

Auto-ignition temperature: Not available.

Flash point (°C), method: None

Lower flammability limit (% vol): Not applicable.

Upper flammability limit (% vol): Not applicable. Not available.

Sensitivity to mechanical impact: Not available.

Hazardous combustion products: Oxides of carbon (COx). Hydrocarbons.

Rate of burning: Not available.

Explosive power: Containers may rupture if exposed to heat or fire.

SECTION 5 : REACTIVITY DATA

Chemical stability: Product is stable under normal handling and storage conditions.

Conditions of instability: Extreme temperatures.

Hazardous polymerization: Will not occur.

Incompatible substances: Strong acids. Strong oxidizing agents.

Hazardous decomposition products: See hazardous combustion products.

SECTION 6 : HEALTH HAZARD DATA

Route of entry: Skin contact, eye contact, inhalation and ingestion.

Effects of Acute Exposure

Eye contact: May cause irritation.

Skin contact: Prolonged and repeated contact may cause irritation.

Inhalation: May cause headache and nausea.

Ingestion: May cause vomiting and diarrhea. May cause gastric distress.

Effects of chronic exposure: See effects of acute exposure.

LD50 of product, species & route: > 5000 mg/kg rat oral.

LC50 of product, species & route: Not available.

Exposure limit of material: Not available.

Sensitization to product: Not available.

Carcinogenic effects: Not listed as a carcinogen.

Reproductive effects: Not available.

Teratogenicity: Not available.

Mutagenicity: Not available.

Synergistic materials: Not available.

Medical conditions aggravated by exposure: Not available.

FIRST AID

Skin contact: Remove contaminated clothing. Wash thoroughly with soap and water. Seek medical attention if irritation persists.

Eye contact: Check for and remove contact lenses. Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.

Inhalation: Remove victim to fresh air. If irritation persists, seek medical attention.

Ingestion: Do not induce vomiting, seek medical attention. Dilute with two glasses of water. Never give anything by mouth to an unconscious person.

SECTION 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak/Spill: Contain the spill. Prevent entry into drains, sewers, and other waterways. Wear appropriate protective equipment. Small amounts may be flushed to sewer with water. Soak up with an absorbent material. Place in appropriate container for disposal. Notify the appropriate authorities as required.

Waste disposal: In accordance with local and federal regulations.

Handling procedures and equipment: Protect against physical damage. Avoid breathing vapors/mists. Wear personal protective equipment appropriate to task. Wash thoroughly after handling. Keep out of reach of children. Avoid contact with skin, eyes and clothing. Avoid extreme temperatures. Launder contaminated clothing prior to reuse.

Storage requirements: Store away from incompatible materials. Keep containers closed when not in use.

SECTION 8 : CONTROL MEASURES

Precautionary Measures

Gloves/Type: Wear appropriate gloves.

Respiratory/Type: None required under normal use.

Eye/Type: Safety glasses recommended.

Footwear/Type: Safety shoes per local regulations.

Clothing/Type: As required to prevent skin contact.

Other/Type: Eye wash facility should be in close proximity. Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.



Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ACETONE

1. Product Identification

Synonyms: Dimethylketone; 2-propanone; dimethylketal

CAS No.: 67-64-1

Molecular Weight: 58.08

Chemical Formula: (CH₃)₂CO

Product Codes: J.T. Baker: 5008, 5018, 5356, 5580, 9001, 9002, 9003, 9004, 9005, 9006, 9007, 9008, 9009, 9010, 9015, 9024, 9036, 9125, 9254, 9271, A134, V655; Mallinckrodt: 0018, 2432, 2435, 2437, 2438, 2440, 2443, 2445, 2850, H451, H580, H981

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Acetone	67-64-1	99 - 100%	Yes

3. Hazards Identification

Emergency Overview: DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

SAF-T-DATA^(tm) Ratings

Health Rating: 2 - Moderate

Flammability Rating: 3 - Severe (Flammable)

Reactivity Rating: 0 - None

Contact Rating: 3 - Severe

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation: Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache. Higher concentrations can produce central nervous system depression, narcosis, and unconsciousness.

Ingestion: Swallowing small amounts is not likely to produce harmful effects. Ingestion of larger amounts may produce abdominal pain, nausea and vomiting. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms are expected to parallel inhalation.

Skin Contact: Irritating due to defatting action on skin. Causes redness, pain, drying and cracking of the skin.

Eye Contact: Vapors are irritating to the eyes. Splashes may cause severe irritation, with stinging, tearing, redness and pain.

Chronic Exposure: Prolonged or repeated skin contact may produce severe irritation or dermatitis.

Aggravation of Pre-existing Conditions: Use of alcoholic beverages enhances toxic effects. Exposure may increase the toxic potential of chlorinated hydrocarbons, such as chloroform, trichloroethane.

4. First Aid Measures

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact: Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

5. Fire Fighting Measures

Fire: Flash point: -20C (-4F) CC

Autoignition temperature: 465C (869F)

Flammable limits in air % by volume: lel: 2.5; uel: 12.8

Extremely Flammable Liquid and Vapor! Vapor may cause flash fire.

Explosion: Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. This material may produce a floating fire hazard. Sensitive to static discharge.

Fire Extinguishing Media: Dry chemical, alcohol foam or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information: In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast

Guard National Response Center is (800) 424-8802.

J. T. Baker **SOLUSORB®** solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

Acetone: OSHA Permissible Exposure Limit (PEL): 1000 ppm (TWA)

ACGIH Threshold Limit Value (TLV): 500 ppm (TWA), 750 ppm (STEL) A4 - not classifiable as a human carcinogen

Ventilation System: A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved): If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance: Clear, colorless, volatile liquid.

Odor: Fragrant, mint-like

Solubility: Miscible in all proportions in water.

Specific Gravity: 0.79 @ 20C/4C

pH: No information found.

% Volatiles by volume @ 21C (70F): 100

Boiling Point: 56.5C (133F) @ 760 mm Hg

Melting Point: -95C (-139F)

Vapor Density (Air=1): 2.0

Vapor Pressure (mm Hg): 400 @ 39.5C (104F)

Evaporation Rate (BuAc=1): ca. 7.7

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Concentrated nitric and sulfuric acid mixtures, oxidizing materials, chloroform, alkalis, chlorine compounds, acids, potassium t-butoxide.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Oral rat LD50: 5800 mg/kg; Inhalation rat LC50: 50,100mg/m³; Irritation eye rabbit, Standard Draize, 20 mg severe; investigated as a tumorigen, mutagen, reproductive effector.

-----\Cancer Lists\-----			
Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Acetone (67-64-1)	No	No	None

12. Ecological Information

Environmental Fate: When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material is expected to readily biodegrade. When released to water, this material is expected to quickly evaporate. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition.

Environmental Toxicity: This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility.

Processing, use or contamination of this product may change the waste management options.

State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ACETONE

Hazard Class: 3

UN/NA: UN1090 Packing Group: II

Information reported for product/size: 188L

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----

Ingredient	TSCA	EC	Japan	Australia
Acetone (67-64-1)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----

Ingredient	Korea	DSL	NDSL	Phil.	--Canada--
Acetone (67-64-1)	Yes	Yes	No	Yes	

-----\Federal, State & International Regulations - Part 1\-----

Ingredient	-SARA 302-		-----SARA 313-----	
	RQ	TPQ	List	Chemical Catg.
Acetone (67-64-1)	No	No	Yes	No

-----\Federal, State & International Regulations - Part 2\-----

Ingredient	CERCLA	-RCRA-	-TSCA-
		261.33	8 (d)
Acetone (67-64-1)	5000	U002	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
 SARA 311/312: Acute: Yes Chronic: No Fire: Yes Pressure: No
 Reactivity: No (Pure / Liquid)

16. Other Information

NFPA Ratings: Health: **1** Flammability: **3** Reactivity: **0**

Label Hazard Warning: DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

Label Precautions: Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Avoid breathing vapor. Avoid contact with eyes, skin and clothing.

Label First Aid: Aspiration hazard. If swallowed, vomiting may occur spontaneously, but **DO NOT INDUCE**. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use: Laboratory Reagent.

MSDS *Material Safety Data Sheet*

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ISOPROPYL ALCOHOL (90 - 100%)

1. Product Identification

Synonyms: 2-Propanol; sec-propyl alcohol; isopropanol; sec-propanol; dimethylcarbinol

CAS No.: 67-63-0

Molecular Weight: 60.10

Chemical Formula: (CH₃)₂CHOH

Product Codes: J.T. Baker: 0562, 5082, 9037, 9080, U298; Mallinckrodt: 0562, 3027, 3031, 3032, 3035, 3037, 3043, 4359, 6569, H604, H982, V555, V566, V681

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Isopropyl Alcohol	67-63-0	90 - 100%	Yes
Water	7732-18-5	0 - 10%	No

3. Hazards Identification

Emergency Overview WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE IRRITATION TO SKIN.

SAF-T-DATA^(tm) Ratings

Health Rating: 2 - Moderate

Flammability Rating: 3 - Severe (Flammable)

Reactivity Rating: 2 - Moderate

Contact Rating: 3 - Severe

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation: Inhalation of vapors irritates the respiratory tract. Exposure to high concentrations has a narcotic effect, producing symptoms of dizziness, drowsiness, headache, staggering, unconsciousness and possibly death.

Ingestion: Can cause drowsiness, unconsciousness, and death. Gastrointestinal pain, cramps, nausea, vomiting, and diarrhea may also result. The single lethal dose for a human adult = about

250 mls (8 ounces).

Skin Contact: May cause irritation with redness and pain. May be absorbed through the skin with possible systemic effects.

Eye Contact: Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.

Chronic Exposure: Chronic exposure may cause skin effects.

Aggravation of Pre-existing Conditions: Persons with pre-existing skin disorders or impaired liver, kidney, or pulmonary function may be more susceptible to the effects of this agent.

4. First Aid Measures

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact: Immediately flush skin with plenty of water for at least 15 minutes. Call a physician if irritation develops.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire: Flash point: 12C (54F) CC

Autoignition temperature: 399C (750F)

Flammable limits in air % by volume: lel: 2.0; uel: 12.7

Listed fire data is for Pure Isopropyl Alcohol.

Explosion: Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information: In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

J. T. Baker **SOLUSORB**® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks.

Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Small quantities of peroxides can form on prolonged storage. Exposure to light and/or air significantly increases the rate of peroxide formation. If evaporated to a residue, the mixture of peroxides and isopropanol may explode when exposed to heat or shock.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits: For Isopropyl Alcohol (2-Propanol):

OSHA Permissible Exposure Limit (PEL): 400 ppm (TWA)

ACGIH Threshold Limit Value (TLV): 200 ppm (TWA), 400 ppm (STEL), A4 - not classifiable as a human carcinogen.

Ventilation System: A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved): If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene and nitrile rubber are recommended materials.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance: Clear, colorless liquid.

Odor: Rubbing alcohol.

Solubility: Miscible in water.

Specific Gravity: 0.79 @ 20C/4C

pH: No information found.

% Volatiles by volume @ 21C (70F): 100

Boiling Point: 82C (180F)

Melting Point: -89C (-128F)

Vapor Density (Air=1): 2.1

Vapor Pressure (mm Hg): 44 @ 25C (77F)

Evaporation Rate (BuAc=1): 2.83

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage. Heat and sunlight can contribute to instability.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Heat, flame, strong oxidizers, acetaldehyde, acids, chlorine, ethylene oxide,

hydrogen-palladium combination, hydrogen peroxide-sulfuric acid combination, potassium tert-butoxide, hypochlorous acid, isocyanates, nitroform, phosgene, aluminum, oleum and perchloric acid.

Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Oral rat LD50: 5045 mg/kg; skin rabbit LD50: 12.8 gm/kg; inhalation rat LC50: 16,000 ppm/8-hour; investigated as a tumorigen, mutagen, reproductive effector.

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Isopropyl Alcohol (67-63-0)	No	No	3
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate: When released into the soil, this material is expected to quickly evaporate. When released into the soil, this material may leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. When released into water, this material may biodegrade to a moderate extent. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.

Environmental Toxicity: The LC50/96-hour values for fish are over 100 mg/l. This material is not expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ISOPROPANOL

Hazard Class: 3

UN/NA: UN1219 Packing Group: II

Information reported for product/size: 200L

15. Regulatory Information

Ingredient	-----\Chemical Inventory Status - Part 1\-----			
	TSCA	EC	Japan	Australia
Isopropyl Alcohol (67-63-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----

Ingredient	--Canada--			
	Korea	DSL	NDSL	Phil.
Isopropyl Alcohol (67-63-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----

Ingredient	-SARA 302-		-----SARA 313-----	
	RQ	TPQ	List	Chemical Catg.
Isopropyl Alcohol (67-63-0)	No	No	Yes	No
Water (7732-18-5)	No	No	No	No

-----\Federal, State & International Regulations - Part 2\-----

Ingredient	CERCLA	-RCRA-	-TSCA-
		261.33	8 (d)
Isopropyl Alcohol (67-63-0)	No	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
 SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
 Reactivity: No (Mixture / Liquid)

16. Other Information

NFPA Ratings: Health: **1** Flammability: **3** Reactivity: **0**

Label Hazard Warning: WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE IRRITATION TO SKIN.

Label Precautions: Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Avoid breathing vapor or mist. Avoid contact with eyes, skin and clothing.

Label First Aid: If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes.

Wash clothing before reuse. In all cases, get medical attention.

Product Use: Laboratory Reagent.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

CALCIUM CARBONATE

1. Product Identification

Synonyms: Carbonic acid calcium salt; calcite; aragonite; limestone

CAS No.: 471-34-1

Molecular Weight: 100.09

Chemical Formula: CaCO₃

Product Codes: J.T. Baker: 1288, 1294, 1300, 1301, 4485, 4918; Mallinckrodt: 1281, 1282, 1390, 2939, 4052, 4061, 4071, 4072, 6210, 6895

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Calcium Carbonate	471-34-1	90 - 100%	Yes

3. Hazards Identification

Emergency Overview: CAUTION! MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. NUISANCE DUST.

J.T. Baker SAF-T-DATA^(tm) Ratings

Health Rating: 0 - None

Flammability Rating: 0 - None

Reactivity Rating: 0 - None

Contact Rating: 1 - Slight

Lab Protective Equip: GOGGLES; LAB COAT

Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation: Excessive concentrations of a nuisance dust may cause nuisance condition such as coughing, sneezing, and nasal irritation.

Ingestion: Non-toxic.

Skin Contact: Not expected to be a health hazard from skin exposure.

Eye Contact: No information found, but presumed to cause mechanical irritation.

Chronic Exposure: Excessive oral doses of calcium carbonate may produce alkalosis and hypercalcemia.

Aggravation of Pre-existing Conditions: No information found.

4. First Aid Measures

Inhalation: Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion: If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact: Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact: Wash thoroughly with running water. Get medical advice if irritation develops.

5. Fire Fighting Measures

Fire: Not considered to be a fire hazard.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Special Information: In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits: OSHA Permissible Exposure Limit (PEL): 15 mg/m³ total dust, 5 mg/m³ respirable fraction for nuisance dusts. ACGIH Threshold Limit Value (TLV) for Particulates (insoluble or poorly soluble) Not Otherwise Specified (PNOS): 3 mg/m³ respirable particles and 10 mg/m³ inhalable particles.

Ventilation System: A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved): If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Gloves and lab coat, apron or coveralls.

Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance: Fine, white powder.

Odor: Odorless.

Solubility: 0.001 gm in 100 ml water, soluble in dilute acids.

Density: 2.7 - 2.95

pH: No information found.

% Volatiles by volume @ 21C (70F): 0

Boiling Point: Not applicable.

Melting Point: 825C (1517F)

Vapor Density (Air=1): No information found.

Vapor Pressure (mm Hg): No information found.

Evaporation Rate (BuAc=1): No information found.

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: When heated to decomposition (825C), emits calcium oxide fumes and liberates carbon dioxide.

Hazardous Polymerization: Will not occur.

Incompatibilities: Acids, fluorine, magnesium with hydrogen.

Conditions to Avoid: Heat, incompatibles.

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Calcium Carbonate (471-34-1)	No	No	None

12. Ecological Information

Environmental Fate: No information found.

Environmental Toxicity: No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

 Not regulated.

15. Regulatory Information

Ingredient	-----\Chemical Inventory Status - Part 1\-----			
	TSCA	EC	Japan	Australia
Calcium Carbonate (471-34-1)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	--Canada--		
		DSL	NDSL	Phil.
Calcium Carbonate (471-34-1)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----				
Ingredient	-SARA 302-		-----SARA 313-----	
	RQ	TPQ	List	Chemical Catg.
Calcium Carbonate (471-34-1)	No	No	No	No

-----\Federal, State & International Regulations - Part 2\-----				
Ingredient	CERCLA	-RCRA-	-TSCA-	
		261.33	8 (d)	
Calcium Carbonate (471-34-1)	No	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
 SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
 Reactivity: No (Pure / Solid)

16. Other Information

NFPA Ratings: Health: **0** Flammability: **0** Reactivity: **0**

Label Hazard Warning: CAUTION! MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. NUISANCE DUST.

Label Precautions: Avoid contact with eyes, skin and clothing. Wash thoroughly after handling. Avoid breathing dust. Keep container closed. Use with adequate ventilation.

Label First Aid: In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. If irritation develops call a physician. If inhaled, remove to fresh air. Get medical attention for any breathing difficulty.

Product Use: Laboratory Reagent.

CUPRIC SULPHATE MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT IDENTIFICATION

Product Use: Mine flotation reagent. Also, where licensed and labeled correctly it can be used as an animal feed micronutrient or a fungicide or algicide. Where labeled correctly and registered with State/Provincial Department of Agriculture it can be used as a soil amendment in copper deficient soils. When prescribed by a veterinarian can also be used in a hoof bath to combat foot rot in cattle and sheep.

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient Cupric Sulphate Pentahydrate

Approximate Percent by Weight 99

C.A.S. Number 7758-99-8

Occupational Exposure Limits (OELs): OSHA PEL 1 mg/m³, ACGIH TLV 1 mg/m³, NIOSH REL 1 mg/m³

LD50 / LC50 Species and Route LD50 oral-rat 300 mg/kg

Trade Names and Synonyms: Copper Sulfate, Copper Sulphate, Copper II Sulphate, Bluestone, Blue Vitriol.

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview: A white to blue granular crystal that does not burn or readily decompose in a fire situation. Cupric sulphate particles may cause eye and respiratory irritation. It is highly soluble in water and toxic to fish and other aquatic organisms.

Potential Health Effects: Inhalation may cause irritation of the respiratory tract. Eye contact will cause irritation and may result in conjunctivitis, ulceration, and corneal opacities. Skin contact may cause mild irritation. Ingestion may result in gastritis, nausea, vomiting, diarrhea and ulceration of the gastrointestinal tract. Severe poisoning or death may result from ingesting large doses. Cupric sulphate is not listed as a carcinogen by OSHA, NTP, IARC, ACGIH or the EU. (see Toxicological Information, Section 11)

Potential Environmental Effects: This product is highly water soluble and is toxic to fish and other aquatic life. It can also be toxic to plant life and other terrestrial organisms at elevated concentrations in soils. (see Ecological Information, Section 12)

EU Risk Phrase(s): R22 – Harmful if swallowed; R36/38 - Irritating to eyes and skin.

SECTION 4. FIRST AID MEASURES

Eye Contact: Immediately flush with warm, running water, including under the eyelids, for at least 15 minutes. Seek medical attention immediately.

Skin Contact: Remove contaminated clothing and wash affected area with soap and warm water. Seek medical attention if irritation persists or develops. Wash contaminated clothing before reuse.

Inhalation: Remove victim from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Medical oxygen may be administered, if available, where breathing is difficult. Seek medical attention immediately.

Ingestion: If victim is conscious and can swallow, dilute stomach contents with 2 to 4 cupfuls of water or milk. Do not induce vomiting. Ingestion of cupric sulphate normally leads to spontaneous vomiting. When vomiting occurs naturally, rinse mouth and repeat administration of water. Seek medical attention immediately and bring a copy of this MSDS. Never give anything by mouth to an unconscious person.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Cupric sulphate is not flammable or combustible.

Extinguishing Media: Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam. Do not release runoff from fire control methods to sewers or waterways.

Fire Fighting: Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

Flashpoint and Method: Not Applicable.

Upper and Lower Flammable Limit: Not Applicable.

Autoignition Temperature: Not Applicable.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection and using methods which will minimize dust generation (e.g., vacuum solids, dampen material and shovel or wet sweep). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labeled containers for recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

Personal Precautions: Protective clothing, gloves, and close-fitting safety goggles are recommended for persons responding to an accidental release (see also Section 8). Respiratory protection equipment should be worn where exposure to hazardous levels of dust is possible.

Environmental Precautions: This product can pose a threat to the environment. Contamination of soil and water should be prevented. Keep spillage from entering ground, streams or sewers.

SECTION 7. HANDLING AND STORAGE

Store containers in a dry, cool, well-ventilated area, away from incompatible materials. Keep container tightly closed. Protect from physical damage. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas.

EU Safety Phrase(s): S22 - do not inhale dust.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Clothing: Coveralls or other work clothing and gloves are recommended to prevent prolonged or repeated direct skin contact. Close-fitting safety goggles should be worn to prevent eye contact if excessive dust is generated or where any possibility exists that eye contact with crystals may occur. An eyewash and quick drench shower should be provided near the work area. Workers should wash immediately when skin becomes contaminated and at the end of each work shift. Work clothing should be removed immediately if it becomes heavily contaminated and should be changed daily if there is reasonable probability that the clothing may be contaminated.

Ventilation: Use adequate local or general ventilation to maintain the concentration of cupric sulphate dust in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system.

Respiratory Protection: Where cupric sulphate dust is generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-95 particulate filter cartridge).

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: White to blue granular or crystal solid

Odour: None

Physical State: Solid

pH: Not Applicable

Vapour Pressure: Negligible @ 20°C

Vapour Density: Not Applicable

Boiling Point/Range: Not Applicable

Freezing/Melting Point/Range: Dehydrates (loses water) @ 30°C, 110°C and 250°C.

Decomposes at @ 560°C

Specific Gravity: 2.29

Evaporation Rate: Not Applicable

Coefficient of Water/Oil Distribution: Not Available

Odour Threshold: None

Solubility in Water: 31.6g/100 ml @ 0°C

SECTION 10. STABILITY AND REACTIVITY

Stability and Reactivity: This material is stable and not considered reactive under normal temperatures and pressures.

Incompatibilities: Hydroxylamine, magnesium, acetylene, sodium hypobromite, and nitromethane. Can be highly corrosive to most ferrous-based metals when moist.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting, electric arc welding or arc-air gouging may generate toxic copper fumes and sulphur dioxide. The fumes will contain copper oxides, which, on inhalation in sufficient quantity, can produce metal fume fever.

SECTION 11. TOXICOLOGICAL INFORMATION

General: The major routes of exposure are inhalation or ingestion of dust and fumes. Although copper is an essential element, mutagenicity and genotoxicity assays have produced equivocal positive results. When heated this product can release toxic sulphur dioxide gas. Individuals with “Wilson’s Disease” are predisposed to accumulate copper and should not be occupationally exposed.

Acute:

Skin/Eye: Likely to cause eye irritation. Eye contact with particles of cupric sulphate may cause conjunctivitis, ulceration and corneal opacities (clouding). Cupric sulphate may also cause skin irritation, particularly in some sensitive individuals.

Inhalation: Inhalation of dust and mists of copper salts can result in irritation of nasal mucous membranes. If copper salts from inhalation reach the GI tract in sufficient quantity they act as irritants, producing a metallic taste, salivation, nausea, vomiting, gastric pain and diarrhea. Sudden and excessive exposure to copper fume can lead to nausea and metal fume fever. This can result in flu-like symptoms of fever, chills, nausea, muscle pain, vomiting and dryness in the mouth and throat.

Ingestion: Will cause metallic taste, burning in the GI tract, repeated vomiting and in more severe cases, diarrhea and ulceration of the gastrointestinal tract. Severe cases may cause renal injury and death.

Chronic: Repeated or prolonged skin contact with cupric sulphate can cause irritation. Some individuals become sensitized to cupric sulphate and develop allergic contact dermatitis. Inhalation of dust and mists of copper salts can result in irritation of nasal mucous membranes and, on occasion, ulceration with perforation of the nasal septum. Repeated inhalation of a copper sulphate mist has resulted in a condition known as “vineyard sprayer’s lung”. The condition is asymptomatic until later stages, when symptoms include weakness, malaise, loss of

appetite and weight, cough and greenish-brown sputum. Greenish tumours may occur in the liver and lungs of affected persons. Cupric sulphate is not listed as a carcinogen by OSHA, the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), the ACGIH or the European Union (EU).

SECTION 12. ECOLOGICAL INFORMATION

Copper is accumulated by plants and animals but biomagnification has not been shown to occur in either aquatic or terrestrial food chains. Dissolved copper can be highly toxic to aquatic life at relatively low concentrations with pH, hardness and dissolved organic compounds being factors that regulate the degree of toxicity. In soil, copper can be particularly toxic to invertebrates and phytotoxic to plants at elevated concentrations with soil properties being regulating factors.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations. Do not wash down drain or allow to reach natural watercourses.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME.....Environmentally Hazardous Substance, Solid,
n.o.s. (Cupric Sulphate)
HAZARD CLASSIFICATION (CANADA and U.S.)Class 9, Packing
Group III
PRODUCT IDENTIFICATION NUMBERUN3077
MARINE POLLUTANT (US).....Yes, Severe
MARINE POLLUTANT (IMO).....Yes, Severe

SECTION 15. REGULATORY INFORMATION

LISTED ON TSCA INVENTORY.....Yes
HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD--Yes
CERCLA SECTION 103 HAZARDOUS SUBSTANCES--Cupric Sulfate Yes Reportable
Quantity: 10 pounds (4.54 kg.)
EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE--No
EPCRA SECTION 311/312 HAZARD CATEGORIES--Immediate (Acute) Health Hazard –
Toxic Immediate (Acute) Health Hazard - Irritant
EPCRA SECTION 313 Toxic Release Inventory--This product contains reportable levels of the
following toxic chemicals subject to the Toxic Release Reporting Requirements: Copper
Compounds (Cupric Sulphate)
CAS No. 7758-99-8
Percent by Weight: 99%



Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

HYDROCHLORIC ACID, 33 - 40%

1. Product Identification

Synonyms: Muriatic acid; hydrogen chloride, aqueous

CAS No.: 7647-01-0

Molecular Weight: 36.46

Chemical Formula: HCl

Product Codes: J.T. Baker: 5367, 5537, 5575, 5800, 5814, 5821, 5839, 5861, 5894, 5962, 5972, 5994, 6900, 7831, 9529, 9530, 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9544, 9548;
Mallinckrodt: 2062, 2515, 2612, 2624, 2626, 3861, 5583, 5587, H611, H613, H987, H992, H999, V078, V628

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hydrogen Chloride	7647-01-0	33 - 40%	Yes
Water	7732-18-5	60 - 67%	No

3. Hazards Identification

Emergency Overview: POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

SAF-T-DATA^(tm) Ratings

Health Rating: 3 - Severe (Poison)

Flammability Rating: 0 - None

Reactivity Rating: 2 - Moderate

Contact Rating: 4 - Extreme (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation: Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.

Ingestion: Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea.

Swallowing may be fatal.

Skin Contact: Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and discolor skin.

Eye Contact: Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Chronic Exposure: Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions: Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

4. First Aid Measures

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion: DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. 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. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire: Extreme heat or contact with metals can release flammable hydrogen gas.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media: If involved in a fire, use water spray. Neutralize with soda ash or slaked lime.

Special Information: In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never

add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

For Hydrochloric acid: OSHA Permissible Exposure Limit (PEL): 5 ppm (Ceiling)
ACGIH Threshold Limit Value (TLV): 2 ppm (Ceiling), A4 Not classifiable as a human carcinogen

Ventilation System: A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved): If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance: Colorless, fuming liquid.

Odor: Pungent odor of hydrogen chloride.

Solubility: Infinite in water with slight evolution of heat.

Density: 1.18

pH: For HCL solutions: 0.1 (1.0 N), 1.1 (0.1 N), 2.02 (0.01 N)

% Volatiles by volume @ 21C (70F): 100

Boiling Point: 53C (127F) Azeotrope (20.2%) boils at 109C (228F)

Melting Point: -74C (-101F)

Vapor Density (Air=1): No information found.

Vapor Pressure (mm Hg): 190 @ 25C (77F)

Evaporation Rate (BuAc=1): No information found.

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products: When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas.

Hazardous Polymerization: Will not occur.

Incompatibilities: A strong mineral acid, concentrated hydrochloric acid is incompatible with many substances and highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides,

sulfides, sulfites, and formaldehyde.
Conditions to Avoid: Heat, direct sunlight.

11. Toxicological Information

Inhalation rat LC50: 3124 ppm/1H; oral rabbit LD50: 900 mg/kg (Hydrochloric acid concentrated); investigated as a tumorigen, mutagen, reproductive effector.

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-----\Cancer Lists\-----
Ingredient                                ---NTP Carcinogen---
Known      Anticipated      IARC Category
-----
Hydrogen Chloride (7647-01-0)             No           No           3
Water (7732-18-5)                         No           No           None
  
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12. Ecological Information

Environmental Fate: When released into the soil, this material is not expected to biodegrade. When released into the soil, this material may leach into groundwater.

Environmental Toxicity: This material is expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: HYDROCHLORIC ACID

Hazard Class: 8

UN/NA: UN1789 Packing Group: II

Information reported for product/size: 475LB

15. Regulatory Information

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-----\Chemical Inventory Status - Part 1\-----
Ingredient                                TSCA  EC   Japan  Australia
-----
Hydrogen Chloride (7647-01-0)             Yes   Yes  Yes    Yes
Water (7732-18-5)                         Yes   Yes  Yes    Yes
  
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-----\Chemical Inventory Status - Part 2\-----
Ingredient                                Korea  DSL  NDSL  Phil.
-----
Hydrogen Chloride (7647-01-0)             Yes   Yes  No    Yes
Water (7732-18-5)                         Yes   Yes  No    Yes
  
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-----\Federal, State & International Regulations - Part 1\-----
Ingredient                                -SARA 302-  -----SARA 313-----
RQ    TPQ    List  Chemical Catg.
-----
Hydrogen Chloride (7647-01-0)             5000  500*  Yes   No
Water (7732-18-5)                         No    No    No    No
  
```


-----\Federal, State & International Regulations - Part 2\-----			
Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8 (d)
Hydrogen Chloride (7647-01-0)	5000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**

Label Hazard Warning: **POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.**

Label Precautions: Do not get in eyes, on skin, or on clothing. Do not breathe vapor or mist. Use only with adequate ventilation. Wash thoroughly after handling. Store in a tightly closed container. Remove and wash contaminated clothing promptly.

Label First Aid: In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, **DO NOT INDUCE VOMITING**. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use: Laboratory Reagent.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%

CAS No.: 7697-37-2

Molecular Weight: 63.01

Chemical Formula: HNO₃

Product Codes: J.T. Baker: 411D, 412D, 5371, 5796, 5801, 5826, 5856, 5876, 5896, 9597, 9598, 9600, 9601, 9602, 9603, 9604, 9606, 9607, 9608, 9610, 9616, 9617, 9670; Mallinckrodt: 1409, 2704, 2716, 6623, H862, H988, H993, H998, V077, V633, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	50 - 70%	Yes
Water	7732-18-5	30 - 50%	No

3. Hazards Identification

Emergency Overview: POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

SAF-T-DATA^(tm) Ratings

Health Rating: 4 - Extreme (Poison)

Flammability Rating: 0 - None

Reactivity Rating: 3 - Severe (Oxidizer)

Contact Rating: 4 - Extreme (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation: Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.

Ingestion: Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.

Skin Contact: Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.

Eye Contact: Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Chronic Exposure: Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions: Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion: **DO NOT INDUCE VOMITING!** Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. 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. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire: Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.

Explosion: Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.

Fire Extinguishing Media: Water spray may be used to keep fire exposed containers cool. Do not get water inside container.

Special Information: Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

OSHA Permissible Exposure Limit (PEL): 2 ppm (TWA), 4 ppm (STEL)

ACGIH Threshold Limit Value (TLV): 2 ppm (TWA); 4 ppm (STEL)

Ventilation System: A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved): If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.

Skin Protection: Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance: Colorless to yellowish liquid.

Odor: Suffocating, acrid.

Solubility: Infinitely soluble.

Specific Gravity: 1.41

pH: 1.0 (0.1M solution)

% Volatiles by volume @ 21C (70F): 100 (as water and acid)

Boiling Point: 122C (252F)

Melting Point: -42C (-44F)

Vapor Density (Air=1): 2-3

Vapor Pressure (mm Hg): 48 @ 20C (68F)

Evaporation Rate (BuAc=1): No information found.

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products: When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.

Hazardous Polymerization: Will not occur.

Incompatibilities: A dangerously powerful oxidizing agent, concentrated nitric acid is

incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.

Conditions to Avoid: Light and heat.

11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

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-----\Cancer Lists\-----
Ingredient                                     ---NTP Carcinogen---
Known      Anticipated      IARC Category
-----
Nitric Acid (7697-37-2)                       No             No             None
Water (7732-18-5)                             No             No             None
  
```

12. Ecological Information

Environmental Fate: No information found.

Environmental Toxicity: No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)

Hazard Class: 8

UN/NA: UN2031 Packing Group: II

Information reported for product/size: 6.5GL

15. Regulatory Information

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-----\Chemical Inventory Status - Part 1\-----
Ingredient                                     TSCA  EC   Japan  Australia
-----
Nitric Acid (7697-37-2)                       Yes   Yes  Yes    Yes
Water (7732-18-5)                             Yes   Yes  Yes    Yes
  
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-----\Chemical Inventory Status - Part 2\-----
Ingredient                                     Korea  DSL   NDSL  Phil.
-----
Nitric Acid (7697-37-2)                       Yes   Yes   No    Yes
Water (7732-18-5)                             Yes   Yes   No    Yes
  
```

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-----\Federal, State & International Regulations - Part 1\-----
Ingredient                                     -SARA 302-  -SARA 313-
RQ      TPQ      List  Chemical Catg.
-----
Nitric Acid (7697-37-2)                       1000  1000  Yes    No
Water (7732-18-5)                             No    No    No     No
  
```

-----\Federal, State & International Regulations - Part 2\-----			
Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8 (d)
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

16. Other Information

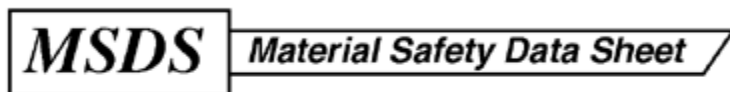
NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: Oxidizer

Label Hazard Warning: **POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.**

Label Precautions: Do not get in eyes, on skin, or on clothing. Do not breathe vapor or mist. Use only with adequate ventilation. Wash thoroughly after handling. Keep from contact with clothing and other combustible materials. Do not store near combustible materials. Store in a tightly closed container. Remove and wash contaminated clothing promptly.

Label First Aid: In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, **DO NOT INDUCE VOMITING**. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use: Laboratory Reagent.



From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

PHOSPHORIC ACID

1. Product Identification

Synonyms: Ortho-phosphoric acid; white phosphoric acid

CAS No.: 7664-38-2

Molecular Weight: 98.00

Chemical Formula: H₃PO₄ in H₂O

Product Codes: J.T. Baker: 0238, 0248, 0259, 0260, 0262, 0263, 0264, 0268, 0273, 0274, 5372, 5592, 5682, 5686, 5804, 5841, 5854, 6908; Mallinckrodt: 2779, 2788, 2796, 3563, H106, XM-223

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Phosphoric Acid	7664-38-2	55 - 95%	Yes
Water	7732-18-5	5 - 45%	No

3. Hazards Identification

Emergency Overview: DANGER! CORROSIVE. CAUSES SEVERE IRRITATION AND BURNS TO EVERY AREA OF CONTACT. HARMFUL IF SWALLOWED OR INHALED.

SAF-T-DATA^(tm) Ratings

Health Rating: 3 - Severe

Flammability Rating: 0 - None

Reactivity Rating: 2 - Moderate

Contact Rating: 4 - Extreme (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation: Inhalation is not an expected hazard unless misted or heated to high temperatures.

Mist or vapor inhalation can cause irritation to the nose, throat, and upper respiratory tract.

Severe exposures can lead to a chemical pneumonitis.

Ingestion: Corrosive. May cause sore throat, abdominal pain, nausea, and severe burns of the mouth, throat, and stomach. Severe exposures can lead to shock, circulatory collapse, and death.

Skin Contact: Corrosive. May cause redness, pain, and severe skin burns.

Eye Contact: Corrosive. May cause redness, pain, blurred vision, eye burns, and permanent eye

damage.

Chronic Exposure: No information found.

Aggravation of Pre-existing Conditions: Persons with pre-existing skin disorders or eye problems, or impaired respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.

Ingestion: If swallowed, **DO NOT INDUCE VOMITING.** Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.

Eye Contact: Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

5. Fire Fighting Measures

Fire: Not considered to be a fire hazard. Contact with most metals causes formation of flammable and explosive hydrogen gas.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire. Water spray may be used to keep fire exposed containers cool. If water is used, use in abundance to control heat and acid build-up.

Special Information: In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture, incompatibilities, and direct sunlight. Corrosive to mild steel. Store in rubber lined or 316 stainless steel designed for phosphoric acid. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Protect from freezing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits: OSHA Permissible Exposure Limit (PEL):1 mg/m³ (TWA)
ACGIH Threshold Limit Value (TLV):1 mg/m³ (TWA), 3 mg/m³ (STEL)

Ventilation System: A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved): If the exposure limit is exceeded, a full facepiece respirator with high efficiency dust/mist filter may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Physical data below refers to concentrated phosphoric acid.

Appearance: Clear, colorless syrupy liquid.

Odor: Odorless.

Solubility: Miscible in all proportions in water.

Specific Gravity: 1.69 @ 25C

pH: 1.5 (0.1 N aqueous solution)

% Volatiles by volume @ 21C (70F): 100

Boiling Point: 158C (316F)

Melting Point: 21C (70F)

Vapor Density (Air=1): 3.4

Vapor Pressure (mm Hg): 0.03 @ 20C (68F)

Evaporation Rate (BuAc=1): No information found.

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage. Substance can supercool without crystallizing.

Hazardous Decomposition Products: Phosphorus oxides may form when heated to decomposition.

Hazardous Polymerization: Will not occur.

Incompatibilities: Liberates explosive hydrogen gas when reacting with chlorides and stainless steel. Can react violently with sodium tetrahydroborate. Exothermic reactions with aldehydes, amines, amides, alcohols and glycols, azo-compounds, carbamates, esters, caustics, phenols and cresols, ketones, organophosphates, epoxides, explosives, combustible materials, unsaturated halides, and organic peroxides. phosphoric acid forms flammable gases with sulfides, mercaptans, cyanides and aldehydes. It also forms toxic fumes with cyanides, sulfide, fluorides, organic peroxides, and halogenated organics. Mixtures with nitromethane are explosive.

Conditions to Avoid: Incompatibles.

11. Toxicological Information

Oral rat LD50: 1530 mg/kg; investigated as a mutagen.

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-----\Cancer Lists\-----

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Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Phosphoric Acid (7664-38-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate: When released into the soil, this material may leach into groundwater. When released to water, acidity may be readily reduced by natural water hardness minerals. The phosphate, however, may persist indefinitely.

Environmental Toxicity: No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility.

Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: PHOSPHORIC ACID, LIQUID

Hazard Class: 8

UN/NA: UN1805 Packing Group: III

Information reported for product/size: 350LB

15. Regulatory Information

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-----\Chemical Inventory Status - Part 1\-----

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Ingredient	TSCA	EC	Japan	Australia
Phosphoric Acid (7664-38-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

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-----\Chemical Inventory Status - Part 2\-----

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Ingredient	Korea	--Canada--		
		DSL	NDSL	Phil.
Phosphoric Acid (7664-38-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

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-----\Federal, State & International Regulations - Part 1\-----

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Ingredient	-SARA 302-		-----SARA 313-----	
	RQ	TPQ	List	Chemical Catg.
Phosphoric Acid (7664-38-2)	No	No	No	No
Water (7732-18-5)	No	No	No	No

-----\Federal, State & International Regulations - Part 2\-----			
Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8 (d)
Phosphoric Acid (7664-38-2)	5000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Pure / Liquid)

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**

Label Hazard Warning: DANGER! CORROSIVE. CAUSES SEVERE IRRITATION AND BURNS TO EVERY AREA OF CONTACT. HARMFUL IF SWALLOWED OR INHALED.

Label Precautions: Do not get in eyes, on skin, or on clothing. Keep container closed. Use only with adequate ventilation. Do not breathe vapor or mist. Wash thoroughly after handling.

Label First Aid: In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician immediately.

Product Use: Laboratory Reagent.



Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

POTASSIUM HYDROXIDE

1. Product Identification

Synonyms: Caustic potash; potassium hydrate

CAS No.: 1310-58-3

Molecular Weight: 56.11

Chemical Formula: KOH

Product Codes: J.T. Baker: 3140, 3141, 3146, 3150, 3152, 5685; Mallinckrodt: 6964, 6976, 6984, 7704, 7815

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Potassium Hydroxide	1310-58-3	85 - 90%	Yes
Water	7732-18-5	10 - 15%	No

3. Hazards Identification

Emergency Overview: POISON! DANGER! CORROSIVE. CAUSES SEVERE BURNS TO SKIN, EYES, RESPIRATORY TRACT, AND GASTROINTESTINAL TRACT. MATERIAL IS EXTREMELY DESTRUCTIVE TO ALL BODY TISSUES. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED.

SAF-T-DATA^(tm) Ratings

Health Rating: 3 - Severe (Poison)

Flammability Rating: 0 - None

Reactivity Rating: 2 - Moderate

Contact Rating: 4 - Extreme (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

Storage Color Code: White Stripe (Store Separately)

Potential Health Effects

Inhalation: Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on the severity of exposure. Symptoms may include coughing, sneezing, damage to the nasal or respiratory tract. High concentrations can cause lung damage.

Ingestion: Toxic! Swallowing may cause severe burns of mouth, throat and stomach. Other symptoms may include vomiting, diarrhea. Severe scarring of tissue and death may result. Estimated lethal dose: 5 grams.

Skin Contact: Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures.

Eye Contact: Highly Corrosive! Causes irritation of eyes with tearing, redness, swelling. Greater exposures cause severe burns with possible blindness resulting.

Chronic Exposure: Prolonged contact with dilute solutions or dust of potassium hydroxide has a destructive effect on tissue.

Aggravation of Pre-existing Conditions: Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion: If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. 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. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire: Not combustible, but contact with water or moisture may generate enough heat to ignite combustibles.

Explosion: Can react with chemically reactive metals such as aluminum, zinc, magnesium, copper, etc. to release hydrogen gas which can form explosive mixtures with air.

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Special Information: Solution process causes formation of corrosive mists. Hot or molten material can react violently with water. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRACIT®-2 or BuCAIM® caustic neutralizers are recommended for spills of solutions of this product.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Protect from moisture. Addition to water releases heat which can result in violent boiling and spattering. Always add slowly and in small amounts. Never use hot water. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits: OSHA Permissible Exposure Limit (PEL): 2 mg/m³ Ceiling
ACGIH Threshold Limit Value (TLV): 2 mg/m³ Ceiling

Ventilation System: A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved): If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance: White deliquescent solid

Odor: Odorless.

Solubility: 52.8% in water @ 20C (68F)

Specific Gravity: 2.04

pH: 13.5 (0.1 molar solution)

% Volatiles by volume @ 21C (70F): 0

Boiling Point: 1320C (2408F)

Melting Point: 360C (680F)

Vapor Density (Air=1): No information found.

Vapor Pressure (mm Hg): 1.0 @ 714C (1317F)

Evaporation Rate (BuAc=1): No information found.

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: Carbon monoxide when reacting with carbohydrates, and hydrogen gas when reacting with aluminum, zinc and tin. Thermal oxidation can produce toxic fumes of potassium oxide (K₂O).

Hazardous Polymerization: Will not occur.

Incompatibilities: Contact with water, acids, flammable liquids and organic halogen compounds, especially trichloroethylene, may cause fire or explosion. Contact with nitromethane and other similar nitro compounds cause formation of shock sensitive salts. Contact with metals such as aluminum, tin and zinc causes formation of flammable hydrogen gas.

Conditions to Avoid: Heat, moisture, incompatibles.

11. Toxicological Information

For potassium hydroxide: Oral rat LD50: 273 mg/kg; Investigated as a mutagen. Skin Irritation Data (std Draize, 50 mg/24 H): Human, Severe; Rabbit, Severe. Eye Irritation Data(Rabbit, non-std test,1 mg/24 H, rinse): Moderate.

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Potassium Hydroxide (1310-58-3)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate: No information found.

Environmental Toxicity: Potassium Hydroxide: TLm: 80 ppm/Mosquito fish/ 24 hr./ Fresh water

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: POTASSIUM HYDROXIDE, SOLID

Hazard Class: 8

UN/NA: UN1813 Packing Group: II

Information reported for product/size: 110LB

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
Potassium Hydroxide (1310-58-3)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	--Canada--		Phil.
		DSL	NDSL	
Potassium Hydroxide (1310-58-3)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----				
Ingredient	-SARA 302-		-----SARA 313-----	
	RQ	TPQ	List	Chemical Catg.
Potassium Hydroxide (1310-58-3)	No	No	No	No

Water (7732-18-5) No No No No

-----\Federal, State & International Regulations - Part 2\-----			
Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8 (d)
Potassium Hydroxide (1310-58-3)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
 SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
 Reactivity: Yes (Mixture / Solid)

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **1**

Label Hazard Warning: POISON! DANGER! CORROSIVE. CAUSES SEVERE BURNS TO SKIN, EYES, RESPIRATORY TRACT, AND GASTROINTESTINAL TRACT. MATERIAL IS EXTREMELY DESTRUCTIVE TO ALL BODY TISSUES. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED.

Label Precautions: Do not get in eyes, on skin, or on clothing. Do not breathe dust. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling.

Label First Aid: If swallowed, **DO NOT INDUCE VOMITING.** Give large quantities of water. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use: Laboratory Reagent.

2. General Chemical Descriptions



Critical-cleaning detergents for laboratory, healthcare and industrial applications

30 Glenn Street
White Plains NY 10603 USA
Tel. 914.948.4040
Fax. 914.948.4088

24 Hour Emergency Number
(CHEM-TEL) (800) 255-3924 in U.S.

(e-mail) cleaning@alconox.com

(URL) <http://www.alconox.com>

- distributors
- technical information
- free samples
- new developments

Fax Document #0412

Liquinox Technical Bulletin



Liquinox™

Critical-Cleaning Liquid Detergent

- Concentrated to save you money
- Replaces corrosive acids and hazardous solvents
- Phosphate free, biodegradable and readily disposable
- Free rinsing to give you reliable results and no interfering residues
- Use to pass your cleaning validation tests for lab accreditation and plant inspection approval

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, disk drives, clean rooms, EEG patient prep, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, pipes, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. Used for phosphate sensitive analysis ware. FDA certified.

Used to remove: Soil, grit, grime, slime, grease, oils, blood, tissue, particulates, deposits, chemical and solvents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, cement and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Used for art restoration. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-in-place. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 ml per liter) in cold, warm or hot water. If available, use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe or ultrasonic method. Not for spray machines, will foam. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic and metal surfaces. Corrosion testing may be advisable.

Available in Convenient Sizes:

	Alconox Cat. #
Case 12 x 1 Quarts	1232
Case 4 x 1 Gallons	1201
15 Gal. Drum	1215
30 Gal. Drum	1230
55 Gal. Drum	1255

1 gal. makes 100 gal. cleaning solution



Liquinox is available from leading laboratory, hospital, clinical and industrial suppliers. To find a distributor for Alconox, Inc. detergents, visit "Find Dealer" at the website. To request FREE samples, visit Sample Request at www.alconox.com, write or call Alconox, Inc. today



Critical-cleaning detergents for laboratory, healthcare and industrial applications

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Fax Document #0412

Liquinox Technical Bulletin

PHYSICAL DATA

TYPICAL VALUE

pH of 1% solution	8.5
Specific gravity (g/ml)	1.07
Density (lbs./gal.)	8.9
Vapor pressure (mm Hg)	10.5
Flash Point (degrees F)	None
Phosphate Content (as Phosphorus)	0%
Organic Carbon (% calculated w/w)	21%
Fragrance Content	0%
Surface Tension 1% Sol'n (Dyne/cm)	32

Color: Pale Yellow

Form: Liquid

Solubility in Water: Completely soluble in all proportions

Hard Water Effectiveness: Highly Effective

Biodegradability: Biodegradable

Foam Tendency: High Foaming

Shelf Life: Two years from the date of manufacture

Chemical Description

Liquinox consists primarily of a homogeneous blend of sodium linear alkylaryl sulfonate, sodium xylene sulfonate, alkanolamide, and ethoxylated alcohol. Liquinox is anionic in nature.

Cleaning Validation Methods:

Test a parameter of rinse water before and after rinsing the cleaned surface, or test the clean surface. No significant change in the parameter indicates no detectable residue. Parameters measured include: pH, conductivity, UV, TOC, HPLC, sodium concentration, phosphorus concentration, anionic surfactant concentration using inexpensive detergent water testing kits, surface tension, and surface analysis. For details see the Pharmaceutical Cleaning Validation References at www.alconox.com

Health Safety Information:

OSHA Hazardous Ingredients: None

RCRA Hazard Class: Non-hazardous

EPA Priority Pollutants: None

DOT Hazard Class: Non-hazardous

Flammability: Non-flammable

Latex Content: None in detergent, packaging materials or adhesives.

Oral Toxicity: (5 g per kg > 500 mg/kg) No ingredient defined as an oral toxicant by OSHA

Eye Irritation: Mild to Moderate eye irritant if not rinsed

Inhalation Toxicity: Non-irritating

VOC Content: 0%

Carcinogenicity:

NTP = No IARC = No OSHA = No

All ingredients in Liquinox are listed in TSCA inventory.

Precautions:

No special precautions other than good industrial hygiene and safety practices employed with any industrial chemical (see Directions). A Material Safety Data Sheet is available at www.alconox.com or by calling fax-on-demand at 914-948-4040 and following the prompts. Use fax document #0312.

Contact Alconox, Inc. for purchase specifications. Information presented is typical.

Not to be taken as specifications. Typical data is not a specification

While the information in this report should not be considered to be a product warranty, we urge you to investigate, test and verify the suitability of Alconox detergents for your specific application. We, of course, can not give permission to use, or recommend the use of, our detergents where they infringe patents. No representation or warranty is made as to the safety of products or materials mentioned under the Federal Food Additives Amendment of 1958.

Acetone

Description:

Acetone (C.A.S. #67-64-1) is the simplest and most important of the ketones. It is a colorless liquid with a mildly pungent and somewhat aromatic odor. It is primarily used as a chemical intermediate and as a solvent for cellulose acetate and nitrocellulose. It is used as a carrier for acetylene, and as a raw material for the chemical synthesis of a wide range of products such as ketene, methyl methacrylate, bisphenol A, diacetone alcohol, mesityl oxide, methyl isobutyl ketone, hexylene glycol, and isophorone.

Chemical properties:

Acetone is a mobile, flammable liquid that is miscible in all proportions with water and with organic solvents such as ether, methanol, ethyl alcohol, and esters. It is incompatible and reactive with oxidizers and acids. Containers of acetone may explode in a fire, producing poisonous gases. Acetone fires may be controlled with carbon dioxide or dry chemical extinguishers. Acetone undergoes many condensation reactions; in the presence of an amine, or ammonia, various esters condense readily with acetone. Synonyms for acetone are dimethyl ketone, methyl ketone, dimethylformaldehyde, ketone propane, and 2-propanone. Acetone is considered a volatile organic compound by the U.S. Environmental Protection Agency.

Identification:

- Chemical Name: Acetone
- Regulatory Name: Acetone
- Formula: CH_3COCH_3
- DOT Label: Flammable Liquid
- CAS: 67-64-1
- STCC: 4908105
- CHRIS: ACT
- UN Number: 1090

Health effects:

When acetone is inhaled, it irritates the eyes, nose and throat. When ingested, it causes dizziness, headaches, light-headedness, dermatitis, and possible unconsciousness. Prolonged or repeated contact with the liquid may dry and defat the skin and cause dermatitis. High exposures may damage the liver and the kidneys; long-term exposure can cause chronic nose and throat irritation.

Exposure Values:

- IDLH: 2500 ppm (NIOSH, 1997)
- TLV TWA: 750 ppm (ACGIH, 1999)
- TLV STEL: 1000 ppm (ACGIH, 1999)
- NIOSH REL: TWA 250 ppm (590 mg/m³)
- OSHA PEL: TWA 1000 ppm (2400 mg/m³)

Regulation:

OSHA has established permissible exposure limits for acetone of 750 ppm (1,800 mg/m³) _ time-weighted average, and 1,000 ppm (2,400 mg/m³) short-term exposure limit.

Hydrochloric Acid

Description

Hydrochloric acid (CAS# 7647-01-0), or hydrogen chloride, is either a colorless liquid with a pungent odor, or a colorless to slightly yellow gas which can be shipped as a liquefied compressed gas. It is used in the manufacture of phosphoric acid, chlorine dioxide, ammonium chloride, fertilizers, dyes, and artificial silk and pigments for paints. It is used as a refining ore in the production of tin and tantalum, as a lab reagent, and as a metal treating agent. It is used to remove scale and dust from boilers and heat exchange equipment, to clean membranes in desalination plants, to increase oil well output, to prepare synthetic rubber products by treating isoprene, and to clean and prepare other metals for coatings. It is used in the neutralization of waste streams, the recovery of zinc from galvanized iron scrap, the production of chloride chemicals, the production of vinyl chloride from acetylene and alkyl chlorides from olefins, the manufacture of sodium glutamate and gelatin, the conversion of cornstarch to syrup, sugar refining, electroplating, soap refining, leather tanning, and the photographic, textile, brewing, and rubber industries. It is used as an antiseptic in toilet bowls against animal pathogenic bacteria, and in food processing as a starch modifier.

Chemical Properties

Hydrochloric acid is one of the most corrosive of the nonoxidizing acids in contact with copper alloys, and is handled in dilute solutions. It is soluble in benzene, alcohol, and ether; it is insoluble in hydrocarbons, and incompatible or reactive with metals, hydroxides, amines, and alkalis. Hydrochloric acid's fumes have an acid, penetrating odor. Aqueous solutions of hydrochloric acid attack and corrode nearly all metals, except mercury, silver, gold, platinum, tantalum, and certain alloys. It may be colored yellow by traces of iron, chlorine, and organic matter. Synonyms for hydrochloric acid are hydrogen chloride, anhydrous hydrogen chloride, aqueous hydrogen chloride, chlorohydric acid, spirit of salts, and muriatic acid.

Identification

Chemical Name: Hydrochloric acid
Regulatory Name: Hydrochloric acid
Formula: HCl
DOT Label: Corrosive
CAS: 7647-01-0
CHRIS: HCl
UN Number: 1789

Health effects

Exposure to hydrochloric acid can cause circulatory collapse which may lead to death; it can also cause asphyxial death due to glottic edema. It can also cause conjunctivitis and corneal burns, inflammation and ulceration of the respiratory tract, dermatitis, skin burns, rhinitis, laryngitis, tracheitis, bronchitis, pulmonary edema, dental erosion, hoarseness, a feeling of suffocation, nausea, vomiting, abdominal pain, diarrhea, dehydration, convulsions, oliguria, hypotension, chills, shock, lethargy, stupor, permanent visual damage, cough, and choking. Ingestion or skin contact with hydrochloric acid can cause corrosion of mucous membranes of the mouth, throat, and esophagus, with immediate pain and dysphagia; it can also cause gastric hemorrhage and intense thirst.

Exposure Values

IDLH: 50 ppm (NIOSH, 1997)

TLV TWA: 5 ppm For Hydrogen Chloride Ceiling Limit. (ACGIH, 1999)

ERPG-1: 3 ppm (AIHA, 1999)

ERPG-2: 20 ppm (AIHA, 1999)

ERPG-3: 15 0 ppm (AIHA, 1999)

NIOSH REL: C 5 ppm (7 mg/m³)

OSHA PEL: C 5 ppm (7 mg/m³)

Nitric Acid

Description

Nitric acid is a colorless, yellow, or red liquid. It is used in the manufacturing of pharmaceuticals, jewelry, urethanes, rubber chemicals, inorganic and organic nitrates, and nitro compounds for fertilizers, dye intermediates, explosives, and other organic chemicals. It is used in the printing industry for photo-engraving, the engineering industry, metallurgy, etching steel, ore flotation, and reprocessing spent nuclear fuel. The largest use of nitric acid, approximately 74- 78%, is for the manufacture of ammonium nitrate, followed by the manufacture of cyclohexanone (8-9%), dinitrotoluene (4%), and nitrobenzene (3-4%).

Synonyms are azotic acid, hydrogen nitrate, nitrous fumes, nitryl hydroxide. acid nitrique (French), acido nitroco (Italian), acido nitrico (Spanish), aqua fortis, azotic acid, azotowy kwas (Polish), engraver's acid, hydrogen nitrate, Kyselina dusicne (Czech), nital, nitrous fumes, nitryl hydroxide, salpetersaure (German), salpeterzuuroplossingen (Dutch).

Chemical Properties

Nitric acid has a characteristic choking odor that is acid and suffocating. It is a strong, monobasic acid and an oxidizing agent. It is a caustic and corrosive liquid which will attack some forms of plastics, rubber, and coatings. It is not combustible, but may give off poisonous oxides of nitrogen and acid fumes when heated in fires. It will react with water or steam to produce heat and toxic, corrosive, and flammable vapors. It reacts violently with alcohol, turpentine, charcoal, sodium and potassium analogs, and organic refuse. It reacts explosively with metallic powders, carbides, cyanides, sulfides, alkalis, turpentine, cesium, rubidium acetylides, and many reducing agents. Acetone is oxidized violently by mixed nitric-sulfuric acids, and if the mixture is confined in a narrow-mouthed vessel, it may be ejected or explode. Mixtures of fuming nitric acid and acetonitrile are high explosives. A jet of ammonia will ignite in nitric acid vapor. Arsine, phosphine, and tetraborane are all oxidized explosively by fuming nitric acid; cyclopentadiene reacts explosively with fuming nitric acid. Phosphine, hydrogen sulfide, and selenide all ignite when the fuming acid is dripped into the gas. Nickel tetraphosphide ignites with fuming nitric acid, and tetraphosphorus diiodide triselenide reacts explosively with it. Hydrogen telluride ignites with the cold concentrated acid, sometimes exploding. In the presence of traces of oxides, it attacks all base metals except aluminum and special chromium steels. It is soluble in cold and hot water, and ether. It stains woolen fabrics and animal tissue a bright yellow. It increases the flammability of combustible organic and readily oxidizable materials, and can cause ignition of some of these materials.

Identification

Chemical Name: Nitric Acid
Regulatory Name: Nitric Acid
Formula: (HNO₃)
CAS: 7697-73-2
STCC: 4930223
CHRIS: NAC
UN Number: 2031

Health effects

Symptoms of overexposure to nitric acid are irritation of eyes, mucous membranes, and skin; delayed pulmonary edema, pneumonitis, bronchitis, and dental erosion. Nitric acid can be corrosive to the skin, eyes, nose, mucous membranes, respiratory and gastrointestinal tracts, or any tissue with which it comes in contact. Severe burns can occur with necrosis and scarring.

Chronic exposure may cause changes in pulmonary function, chronic bronchitis, conjunctivitis, and overt symptoms resembling acute viral respiratory tract infection. Acute exposure can cause delayed dyspnea, circulatory collapse, corneal ulcers, corneal opacity, nasal irritation, throat burn or irritation, shock, cardiac insufficiency, pulmonary edema, dyspnea, headache, gastritis, esophageal and gastric burns, ischemic lesions, dermatitis, and weak or rapid pulse.

Exposure Values

IDLH: 25 ppm (NIOSH, 1997)

TLV TWA: 2 ppm For fuming nitric acid (©ACGIH, 1999)

TLV STEL : 4ppm For fuming nitric acid (©ACGIH, 1999)

NIOSH REL: TWA 2 ppm (5 mg/m³) ST 4 ppm (10 mg/m³)

OSHA PEL: TWA 2 ppm (5 mg/m³)

Phosphoric Acid

Description

Phosphoric acid (CAS #7664-38-2) can exist as a crystal or clear liquid. It is an oily, thick, colorless, and odorless liquid, or a thick, colorless, unstable crystalline solid. It is used in the manufacturing of phosphates, such as salts, soaps, and detergents; fertilizers; yeast; fire control agents; opal glass; electric lights; dental cements; waxes and polishes; gelatin; ethylbenzene, propylene, and cumene; and soft drinks. It is used as an acid catalyst, soil stabilizer, antioxidant in food, acidulant and flavor agent in jellies and preserves, bonding agent for refractory bricks, and gasoline additive. It is also used in the rustproofing and polishing of metals, cotton dyeing, tile cleaning, extracting penicillin, hot stripping for aluminum and zinc substrates, ceramic binding, water treatment, process engraving, electro-polishing, coagulating of rubber latex, operating lithography and photoengraving operations, and pickling. It is used to manufacture the phosphoric acid electrolyte fuel cell system which has created the largest fuel cell built. It has been used to treat lead poisoning.

Chemical Properties

Phosphoric acid is incompatible with strong caustics and most metals. It readily reacts with metals to form flammable hydrogen gas. The liquid can solidify at temperatures below 21 degrees C. It is corrosive to ferrous metals and alloys. It is soluble in alcohol and hot water. It can form three series of salts: primary phosphates, dibasic phosphates, and tribasic phosphates. It is deliquescent and hygroscopic. It is a chelating agent. It has a low vapor pressure at room temperature. Synonyms for phosphoric acid are orthophosphoric acid, metaphosphoric acid, and white phosphoric acid.

Identification

Chemical Name: Phosphoric Acid
Regulatory Name: Phosphoric Acid
Formula: H_3O_4P
DOT Label: Corrosive
CAS: 7664-38-2
STCC: 4930248, 4930247, 4930249
CHRIS: PAC
UN Number: 1805

Health effects

Phosphoric acid can affect human health through inhalation of mist, ingestion, and contact with the skin and eyes. It can severely irritate the upper respiratory tract, eyes, and skin. It can burn the skin, mouth, and eyes, and cause dermatitis, a sour acrid taste, coughing, conjunctivitis, tearing, blepharospasm, severe gastrointestinal irritation, nausea, vomiting, bloody diarrhea, difficult swallowing, severe abdominal pains, extreme thirst, acidemia, difficult breathing, convulsion, shock, and even asphyxial death. It can cause circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine. It can corrode the mucous membranes of the mouth, throat, and esophagus, with immediate pain and dysphagia. People at special risk of exposure to phosphoric acid include those with chronic pulmonary disease, and skin disease.

Exposure Values

IDLH: 1000 mg/m^3 (NIOSH, 1997)
TLV TWA: 1 mg/m^3 (ACGIH, 1999)

TLV STEL: 3 mg/m³ (ACGIH, 1999)
NIOSH REL: TWA 1 mg/m³ ST 3 mg/m³
OSHA PEL: 1 mg/m³, TWA, and 3 mg/m³, STEL

3. Letters from U of A Risk Management re: waste disposal.



Date: August 6, 1987

MEMORANDUM
University of Arizona

To: John Ratje, Assistant Director
Steward Observatory

Dept: Risk Management

From: Lloyd M. Wundrock *L. M. Wundrock*
Chemical Waste Program Coordinator

Campus Ext: 1-5861

Subject: Mirror Cleaning Solution

Due to the fact that your cleaning is a batch type operation and that the analysis represents a concentrated solution prior to water rinsing in the amount of 15 times, I conclude the following:

1. The waste component concentrations are less than those of federal guidelines defining hazardous waste.
2. Because of the volume of water used in the rinsing operation, the waste is also below Pima County discharge limits.

Therefore, wastewater generated by the cleaning process can be introduced into the sewer or allowed to flow onto the ground.

If you have any questions or concerns, please contact me.

LMW:kf

cc: Steve Holland
Martha A. Anderson

Maximum Allowable Daily Discharge Limits for Regulated Substances (mg/l):

	<u>Substance</u>	<u>Limit</u>	<u>Test Method</u>
1.	Arsenic - Total	2.0 (1)	Digestion followed by silver diethyldithio - carbamate; or atomic absorption.
2.	Barium - Total	10.0 (1)	Digestion followed by atomic absorption.
3.	Boron - Total	5.0 (1)	Colorimetric (Curcumin)
4.	Cadmium - Total	0.1 (1)	Digestion followed by atomic absorption or by colorimetric (Dithizone).
5.	Chromium - Total	2.77 (1)	Digestion followed by atomic absorption or by colorimetric (Diphenylcarbazide).
6.	Copper - Total	2.7 (1)	Digestion followed by atomic absorption or by colorimetric (Neocuproine).
7.	Lead - Total	0.5 (1)	Digestion followed by atomic absorption or by colorimetric (Dithizone).
8.	Mercury - Total	0.05 (1)	Flameless atomic absorption.
9.	Nickel - Total	3.98 (1)	Digestion followed by atomic absorption or by colorimetric (Heptoxime).
10.	Selenium - Total	0.5 (1)	Digestion followed by atomic absorption.
11.	Silver - Total	5.0 (1)	Digestion followed by atomic absorption or by colorimetric (Dithizone).
12.	Zinc - Total	2.6 (1)	Digestion followed by atomic absorption or by colorimetric (Dithizone).
13.	Cyanide - Total	1.0 (1)	Distillation followed by silver nitrate titration or pyridine pyrazolone (or barbituric acid) colorimetric.
14.	Oil & Grease	100.0 (1) 200.0 (2)	Liquid - liquid extraction with trichloro-trifluoro-ethane-gravimetric.
15.	Phenols	0.05 (1)	Distillation followed by colorimetric (4AAP)
16.	Sulfide - Total	2.0 (1)	Titrimetric-iodine for levels greater than 1 mg. per liter; Methylene blue photometric.
17.	Sulfide - Dissolved	0.5 (2)	Add NaOH and AlCl ₃ flocculate, settle, and analyze clear liquor by the method referenced for the total sulfide.

Notes:

- (1) Based on a daily composite sample.
(2) Based on a grab sample.

6/27/05

Summary of recent correspondences with U of A Risk Management re our hazmat procedures:

If the total copper content is over 2.7 mg/l or ppm the resulting solution cannot go down the drain to a Pima County Wastewater treatment facility. I would rather it be ground applied with a pH range tighter at 6.5 to 7.5 SU.

The pH range for sewer disposal in Pima County is 6 to 9. I do not want to entertain a discharge permit for a once every three years activity. Let's make sure everyone is safe, protected (adequate PPE), eyewash nearby and land application of the waste.

If there is any way to segregate the acetone, I would for disposal through another route.

Lloyd Wundrock
lloydw@email.arizona.edu

If the process hasn't changed since RM&S's letter was written there aren't any problems. I would contact Lloyd Wundrock at lloydw@email.arizona.edu for an updated letter and review. Lloyd is the Jedi Master for sewer/ground disposal.

Jeff Christensen
jgchrist@email.arizona.edu
520-621-5861

4. References and Resources

1. B. A. Sabol, "Mirror Coating at the Sunnyside Facility: An Operational Guide," MMT Internal Technical Memorandum **88-3** (1988)
2. W. Kindred, J. T. Williams, and D. Clark, "In Situ Aluminization of the MMT 6.5m Primary Mirror," MMTO Technical Report **03-8** (2003)

University of Arizona Department of Risk Management Chemical Hygiene Plan,
http://w3fp.arizona.edu/riskmgmt/chp_table_of_contents.htm

University of Arizona Department of Risk Management Chemical Hygiene Plan, Section on Hazardous Chemical Disposal,
http://w3fp.arizona.edu/riskmgmt/chp_chapter_7.htm#Hazardous%20Chemical%20Disposal

J.T. Baker document, "Planning for Laboratory Emergencies,"
<http://www.jtbaker.com/techlib/documents/labemer.htm>

Phone numbers:

911 for any health emergency

(520)626-6016 Pima County Poison Control

(800)424-9300 Nationwide Poison Control Emergency

(520)621-1790 U of Az Risk Management