

SAFETY DATA SHEET



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CAP A SOLUTION (ACETIC ANHYDRIDE, PYRIDINE IN TETRAHYDROFURAN, 1:1:8)

SDS No. M0508

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Capping Solution (Acetic Anhydride and Pyridine in Tetrahydrofuran, 1:1:8)

Synonyms: Capping Solution

Recommended Use: This product is recommended for laboratory and manufacturing use only. It is not recommended for drug, food or household use.

2. HAZARDS IDENTIFICATION



Classification:

Flammable Liquids: GHS Category 2

Acute Toxicity, Inhalation: GHS Category 3

Acute Toxicity, Dermal: GHS Category 5

Acute Toxicity, Oral: GHS Category 4

Skin Corrosion: GHS Category 1B

Serious Eye Damage: GHS Category 1

Specific Target Organ Exposure, single exposure: GHS Category 3

Label Elements

Signal Word: DANGER!

Hazard Statements:

H225 – Highly flammable liquid and vapor.

H241 – Heating may cause a fire or explosion.

H302 – Harmful if swallowed.

H312 – Harmful in contact with skin.

H314 – Causes severe skin burns and eye damage.

H332 – Harmful if inhaled.

Precautionary Statements:

P210 – Keep away from heat/sparks/open flames/hot surfaces. – No smoking.

P280 – Wear protective gloves/protective clothing/eye protection/face protection.

P284 – Wear respiratory protection.

Clear focus. Consistent results. Complete confidence.

P301+P310 – If SWALLOWED: Immediately call or POISON CENTER or a doctor/physician.

P303+P361+P353 – If on skin or hair: Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.

P304+P341 – If inhaled: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.

Emergency Overview

May be fatal if swallowed, inhaled, or absorbed through the skin. Causes burns and severe irritation to skin, eyes, and respiratory system. Readily absorbs through the skin. Affects cardiovascular system, central nervous system, liver, and kidneys. Highly flammable liquid and vapor. May form explosive peroxides. Hygroscopic.

Health – 2* Flammability – 3 Physical Hazard – 1 PPE – User supplied

NOTE: HMIS ratings use a numbering scale that ranges from 0 - 4 to indicate the degree of hazard. A value of zero means the chemical presents no hazard while a value of four indicates a high hazard. These ratings are based on the inherent properties of this chemical under expected conditions of normal use and are not intended to be used in emergency situations. PPE is determined by the user based on their needs and conditions.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

<u>Ingredient</u>	<u>CAS No</u>	<u>Percent</u>	<u>Hazardous</u>
Acetic Anhydride	108-24-7	9-11%	Yes
Pyridine	110-86-1	9-11%	Yes
Tetrahydrofuran	109-99-9	79-81%	Yes
Acetic Acid	64-19-7	<1%	Yes

4. FIRST-AID MEASURES

Inhalation: If inhaled, remove to fresh air. If breathing is labored or with coughing, give 100% supplemental oxygen. If not breathing, begin artificial respiration, but DO NOT give mouth-to-mouth resuscitation.

Ingestion: If swallowed, rinse mouth with water. Get medical attention immediately; DO NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. If not breathing, begin artificial respiration. DO NOT give mouth-to-mouth resuscitation.

Skin Contact: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover irritated skin with an emollient or anti-bacterial cream. Soap and cold water may be used. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

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

Notes to Physician: Treat symptomatically and supportively. Persons with skin problems or liver, kidney, lung, or blood diseases may be at increased risk from exposure to this product.

5. FIRE FIGHTING MEASURES

Flammability: Flammable liquid and vapor (GHS Category 2)

Auto-ignition Temperature (Acetic Anhydride): 316° C (600° F)

Flash Point (Tetrahydrofuran): -14° C (6° F)

Flammable Limits: Lower Limit – 1.8 vol %, Upper Limit – 12.4 vol %

Products of Combustion: May decompose into toxic products under fire conditions (nitrogen oxides, carbon monoxide, carbon, dioxide).

Specific Fire Hazards: As in any fire, always wear self-contained breathing apparatus in pressure-demand (MSA/NIOSH approved or equivalent), and full protective gear. *Acetic anhydride is water reactive*. Use water spray to keep fire exposed containers cool. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Specific Explosion Hazards: THF forms peroxides of unknown stability.

Fire Fighting Media: Water may be ineffective. Use sand, dry chemical, carbon dioxide, or appropriate foam. If water is the only media available, use in flooding amounts. Cool containers with flooding quantities of water until well after fire is out.

Special Remarks: None

National Fire Protective Association: (ESTIMATED) Health - 2, Flammability - 3, Reactivity - 1

NOTE: NFPA ratings use a numbering scale that ranges from 0 - 4 to indicate the degree of hazard. A value of zero means the chemical presents no hazard while a value of four indicates a high hazard. They are for use by emergency personnel to address the hazards that are presented by short term, acute exposure to this product under fire, spill, or similar emergencies. Ratings involve data and interpretations that may vary from company to company.

6. ACCIDENTAL RELEASE MEASURES

Absorb spilled liquid with sorbent pads, socks, or other inert material such as vermiculite, sand, or earth. Avoid runoff into streams and sewers. Provide ventilation to the affected area and remove all ignition sources. Approach the spill from upwind and pick up absorbed material and place it in a suitable container. Always use proper personal protective equipment as described in section 8.

7. HANDLING AND STORAGE

Precautions: Always use proper personal protective equipment as described in section 8. Wash thoroughly after handling. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Remove contaminated clothing and wash before reuse. Empty containers contain product residue (liquid and vapor) and can be dangerous. Keep container tightly closed and away from heat, spark, and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks, or open flames. Use with adequate ventilation. Avoid breathing vapor or mist.

Storage: Keep in a flammables area away from all sources of ignition and oxidizing materials. Keep in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Protect from moisture.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or using the material should be equipped with eyewash station and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Personal Protection: Wear protective chemical goggles and face shield for eye and face protection. Use appropriate protective gloves and protective clothing to prevent skin exposure. A respiratory protection program that meets OSHA 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever possible. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Exposure Limits (Tetrahydrofuran):

ACGIH – 50 ppm TWA; 100 ppm STEL; Skin – potential significant contribution to overall exposure by cutaneous route
NIOSH – 200 ppm TWA; 590 mg/m³ TWA; 2000 ppm IDLH
OSHA Final PELs – 200 ppm TWA; 590 mg/m³ TWA

Exposure Limits (Pyridine):

ACGIH – 1 ppm TWA;
NIOSH – 5 ppm TWA; 15 mg/m³ TWA; 1000 ppm IDLH
OSHA Final PELs – 5 ppm TWA; 15 mg/m³ TWA
OSHA Vacated PELs: 5 ppm TWA; 15 mg/m³ TWA

Exposure Limits (Acetic Anhydride):

ACGIH – 5 ppm TWA.
NIOSH – 200 ppm IDLH.
OSHA Final PELs – 5 ppm TWA, 20 mg/m³ TWA.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State and Appearance: Colorless liquid.

Odor: Sweetish, ethereal, possibly pungent and penetrating odor

Odor Threshold: Tetrahydrofuran – 2-50 ppm; Pyridine - 0.4 to 20 ppm

Molecular Formula: Not Available

Molecular Weight: Not Available

Auto-ignition Temperature (Acetic Anhydride): 316° C (600° F)

Flash Point (Tetrahydrofuran): -14° C (6° F)

Flammable Limits: Lower Limit –1.8 vol %, Upper Limit – 12.4 vol %

pH: Tetrahydrofuran- about 7 in aqueous solution; Acetic Anhydride – 3 (10g/L aq sol 20°C); Pyridine - 8.5 (0.2 M aqueous solution).

Boiling Point: Tetrahydrofuran - 66° C @ 760 mm Hg; Acetic Anhydride – 140° C @ 760 mm Hg; Pyridine - 115° C @ 760 mm Hg.

Freezing/Melting Point: Tetrahydrofuran: -108.5° C; Acetic Anhydride: not available; Pyridine – (-42° C)

Decomposition Temperature: Tetrahydrofuran – not available; Acetic Anhydride: not available; Pyridine: not available

Specific Gravity: Tetrahydrofuran - 0.89 g/cm³; Acetic Anhydride – 1.082 g/cm³; Pyridine - 0.9780 g/cm³

Vapor Density (Air=1): Tetrahydrofuran – 2.5; Acetic Anhydride – 3.5; Pyridine – 2.73

Vapor Pressure: Tetrahydrofuran - 145 mm Hg @ 25° C; Acetic Anhydride – 3.9 mm Hg @ 68° F; Pyridine - 40.9 mm Hg @ 20° C.

Viscosity: Tetrahydrofuran - 0.48 cP 20° C; Acetic Anhydride - 0.91mPa.s @ 20 deg C; Pyridine - 0.95 mPa at 20° C

Solubility: Tetrahydrofuran is soluble; Acetic Anhydride decomposes in water; Pyridine is soluble.

10. STABILITY AND REACTIVITY

Stability: Stable under normal temperatures and pressures. Acetic Anhydride may decompose if exposed to moist air or water. Substance is readily hydrolyzed. Reacts with water to form acetic acid.

Conditions to Avoid: Ignition sources, excess heat, confined spaces, exposure to moist air or water, contact with water, incompatible materials.

Incompatibility With Various Substances: Metals, oxidizing agents, reducing agents, bases, acids, acid chlorides, chloroformates, alcohols, amines, ammonia, nitrates, nitric acid, permanganates, phenols, sodium hydroxide, hydrogen peroxide, chromium trioxide, potassium hydroxide, perchloric acid, ethanol, oxygen, bromine, metal halides, lithium tetrahydroaluminate, borane, sodium aluminum hydride, sodium tetrahydroaluminate, caustic alkalis.

Hazardous Decomposition Products: Nitrogen oxides, carbon monoxide, carbon, dioxide.

Hazardous Polymerization: May occur in Tetrahydrofuran. Has not been reported in Acetic Anhydride. Will not occur in Pyridine.

11. TOXICOLOGICAL INFORMATION

Routes of Entry: Inhalation, skin absorption, skin contact

Acute Exposure Hazards:

INHALATION HAZARD: May be harmful if inhaled. Causes chemical burns to the respiratory tract. May cause lung damage. Vapors may cause dizziness or suffocation. Inhalation may cause coughing, irritation of the mucous membranes and respiratory tract, difficulty breathing, and loss of consciousness. Inhalation of vapors may cause abnormal liver function as detected by laboratory results. Other symptoms reported with acute exposure to pyridine nervousness, insomnia, and loss of appetite.

INGESTION HAZARD: Causes burns to the gastrointestinal tract. May cause perforation of the digestive tract. May cause gastrointestinal irritation with nausea, vomiting, and diarrhea. May cause liver and kidney damage. May cause central nervous system depression with excitement followed by headache, drowsiness, nausea, and vomiting.

SKIN CONTACT HAZARD: Causes burns and irritation to skin. Tetrahydrofuran and Pyridine are not skin sensitizers in animals. May cause smarting of the skin and first-degree burns after short exposure. Material is readily absorbed through the skin causing symptoms similar to those of inhalation.

EYE CONTACT HAZARD: Contact causes severe eye irritation and burns. Vapors may cause eye irritation. May cause reversible damage.

Chronic Exposure Hazards: Acetic Anhydride effects may be delayed. Prolonged skin contact may be painless and cause redness and subsequently a white appearance of the skin accompanied by wrinkling. Prolonged or repeated eye contact may cause conjunctivitis. Prolonged or repeated skin contact with Tetrahydrofuran may cause defatting and dermatitis.

May cause liver, kidney, and lung damage. Narcotic in high concentrations. Data shows carcinogenic activity in the liver and kidneys of lab animals. Kidney tumors were by a mechanism that has no relevance in humans. Exposures to pyridine that are too low to produce overt clinical symptoms can cause liver damage and repeated low-level exposures can cause cirrhosis. Feeding studies in rats produced blood effects like changes in clotting factors.

Animal Toxicity (Tetrahydrofuran):

Inhalation, rat: LC50 = 21,000 ppm/3H;

Oral, rat: LD50 = 1650 mg/kg;

Animal Toxicity (Acetic Anhydride):

Inhalation, rat: LC50 = 1000 ppm/4H;

Oral, rat: LD50 = 1780 mg/kg;

Skin, rabbit: LD50 = 4 mL/kg;

Animal Toxicity (Pyridine):

Draize test, rabbit, skin: 500 mg/24H Mild;

Inhalation, rat: LC50 = 28,500 mg/m³/1H;

Oral, mouse: LD50 = 1500 mg/kg;

Carcinogenicity: THF is listed by ACGIH as an animal carcinogen with unknown relevance to humans. Acetic Anhydride is not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65. Pyridine is an ACGIH Confirmed animal carcinogen with unknown relevance for humans and a California: carcinogen, initial date 5/17/02.

Tetrahydrofuran

Epidemiology: No information found.

Teratogenicity: Animal data show developmental effects only at exposure levels producing other toxic effects in the adult animal.

Reproductive Effects: Animal testing for reproductive effects shows no change in reproductive performance.

Mutagenicity: THF has not produced damage in mammalian cell cultures or animals. It has not been tested for its ability to cause permanent genetic damage in reproductive cells of mammals (not tested for heritable genetic damage).

Neurotoxicity: No information available.

Pyridine

Epidemiology: No information found.

Teratogenicity: Pyridine cause muscle/skeleton effects when injected into developing chickens but was not teratogenic in frogs at sub lethal doses. The relevance of these studies to human reproduction is unclear.

Reproductive Effects: No information found.

Mutagenicity: Pyridine's mutagenicity potential is equivocal. It was reported to be both positive and negative in Salmonella typhimurium strains. It was not mutagenic in tests for chromosome aberrations, but it did give weak positive results in tests that detect sister chromatid exchanges.

Neurotoxicity: No information found.

Acetic Anhydride

No information found

12. ECOLOGICAL INFORMATION

Ecotoxicity (Tetrahydrofuran):

Fish: Fathead minnow: 2160 mg/L; 94 Hr; flow through bioassay (pH 7.5);

Water flea Daphnia: EC50 = 5930 mg/L; 24 Hr;

THF is not expected to adsorb to suspended matter in water based on its measured Koc values. This compound should volatilize from water surfaces. An estimated BCF value of 1 suggests that THF will not bioconcentrate in aquatic organisms.

Environmental Fate (Tetrahydrofuran): : If released to the atmosphere, Tetrahydrofuran will exist solely in the vapor phase and is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals and nitrate radicals with half-lives of about 1 and 3 days, respectively. Measured Koc values of 23 and 18 indicate that THF will have very high mobility in soil.

Ecotoxicity (Pyridine):

Fish: Fathead minnow: LC50 = 106 mg/L, 96H, flow-through, no data available.

Environmental Fate (Pyridine):

Terrestrial: Should have very high mobility. It is absorbed to acid clay to a moderate extent. Complete degradation in one soil occurred in less than 8 days.

Aquatic: Should biodegrade after an acclimation period and can be lost through volatilization.

Atmospheric: Exists in vapor phase based on a vapor pressure of 20.8 mm Hg and reacts slowly with photochemically produced hydroxyl radicals with experimental half-lives of 32 and 16 days in clean and moderately polluted atmospheres, respectively. Bioconcentration in aquatic animals should not be significant.

Environmental Fate (Acetic Anhydride): Terrestrial: Will readily infiltrate downward toward ground water. Aquatic: Will react slowly and become miscible, and will produce an irritating vapor. Mixing takes place and the spill is diluted. In rivers, the principal mixing agent is stream turbulence. Atmospheric: Since acetic anhydride is a relatively non-volatile liquid, direct venting of the vapor to the atmosphere from a hole in a ruptured vessel does not constitute a significant hazard downwind. Only vapor released from a liquid pool spilled on a ground or water surfaces is important. Not expected to bioconcentrate or degrade.

13. DISPOSAL CONSIDERATIONS

Material that cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Processing, use or contamination of this product may change the waste management options. Waste generators must decide if discarded material is a hazardous waste. State and local disposal regulations may differ from federal disposal definitions found in 40 CFR 261.3. Dispose of container and unused contents in accordance with federal, state and local requirements. Tetrahydrofuran is a "U" listed waste (U213 – ignitable waste). Pyridine is a "U" listed waste (U196).

14. TRANSPORT INFORMATIONUS DOT, IATA, IMO

Proper Shipping Name: Flammable Liquid, corrosive, n.o.s. (Tetrahydrofuran, Pyridine, Acetic Anhydride)

Hazard Class: 3(8)

UN Number: UN2924

Packing Group: II

Canada TDG

Additional Information: Flashpoint -14 C

15. REGULATORY INFORMATIONUS Federal Regulations:

TSCA: CAS# 109-99-9, CAS# 110-86-1, and CAS# 108-24-7 are listed on the TSCA Inventory.

Health and Safety Reporting List: CAS# 110-86-1: Effective 10/4/82, Sunset 10/4/92.

Chemical Test Rules: CAS# 109-99-9 – 40 CFR 799.5115

Section 12b: CAS# 75-05-8 – Section 4, 1% de minimis rule

TSCA Significant New Use Rule: Does not have an SNUR under TSCA.

CERCLA Hazardous Substances: CAS# 109-99-9 – 1000 lb final RQ; 454 kg final RQ; CAS# 108-24-7: 5000 lb final RQ; 2270 kg final RQ; CAS# 110-86-1– 1000 lb/454 kg final RQ

SARA Section 302: Does not have a TPQ

SARA Codes: CAS# 109-99-9 – immediate, fire, reactive; CAS # 108-24-7: immediate, delayed, fire, reactive; CAS# 110-86-1– immediate, delayed, fire.

Section 313: Tetrahydrofuran (CAS# 109-99-9) and Acetic Anhydride (CAS# 108-24-7) are not subject to SARA Title III Section 313 and 40 CFR 373 reporting requirements. Pyridine (CAS# 110-86-1) is subject to SARA Title III Section 313 and 40 CFR 373 reporting requirements.

Clean Air Act: CAS# 109-99-9, CAS# 110-86-1, and CAS# 108-24-7 8 are not listed as a hazardous air pollutant (HAP).

They are not Class 1 Ozone Depleters. They are not Class 2 Ozone Depleters.

Clean Water Act: CAS# 109-99-9 and CAS# 110-86-1 are not listed as a Hazardous Substance. They are not Priority Pollutants. They are not Toxic Pollutants.

Clean Water Act: CAS# 108-24-7 is listed as a Hazardous Substance. It is not a Priority Pollutant. It is not a Toxic Pollutant.

OSHA: Not considered highly hazardous by OSHA.

US State Regulations:

CAS# 109-99-9, CAS# 110-86-1, and CAS# 108-24-7 are on the following state right-to-know lists: California, New Jersey, Pennsylvania, Minnesota, and Massachusetts

California Prop 65: This product contains pyridine, a chemical known to the state of California to cause developmental reproductive toxicity. California No Significant Risk Level: Not listed

Canada:

DSL/NDSL: CAS# 109-99-9, CAS# 110-86-1, and CAS# 108-24-7 are listed on Canada's DSL list.

WHMIS: This product has a WHMIS classification of B2, B3, D1A, D2B, E. This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and this MSDS contains all the information required by those regulations.

Ingredient Disclosure List: CAS# 109-99-9, CAS# 110-86-1, and CAS# 108-24-7 are listed on Canada's Ingredient Disclosure List.

DSCL (EEC):

Hazard Symbols: C, Xn; F

Risk Phrases: R11 – Highly Flammable; R19 – May form explosive peroxides; R20/21/22 – Harmful by inhalation, in contact with skin, and if swallowed; R34 – Causes burns; R36/37/38 – Irritating to eyes, skin, and respiratory system.

Safety Phrases: S16 – Keep away from sources of ignition-no smoking; S26 – In case of contact with eyes, rinse immediately with water and seek medical advice; S28 – After contact with skin, wash immediately with plenty of water; S29: Do not empty into drains; S33: Take precautionary measures against static discharges; S36/37/39: Wear suitable protective clothing, gloves, and eye/face protection; S45 - In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/protection): CAS# 109-99-9: 1; CAS# 108-24-7: 1; CAS# 110-86-1: 2

16. OTHER INFORMATION

Originally Prepared: 2/11/2008

Last Revised: 12/1/2015 – Updated information for eye and face protection in Section 8.

The information contained herein is based on current knowledge and experience; no responsibility is accepted that the information is sufficient or correct in all cases. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers and the protection of the environment.

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