



AIR LIQUIDE

SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS and the Global Harmonization Standard

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: CHROME ETCHANT**SYNONYMS:** None**CHEMICAL FAMILY NAME:** Aqueous Perchloric Acid and Ceric Ammonium Nitrate Solution**FORMULA:** Mixture**RELEVANT USES of the SUBSTANCE:****USES ADVISED AGAINST:**

Document Number: 70585

Metal Etching

Uses Other than Relevant Use

IN U.S. MANUFACTURED/SUPPLIED BY:**ADDRESS:**

AIR LIQUIDE

9101 LBJ Freeway – Suite 800

Dallas, TX 75243-1920

EMAIL ADDRESS FOR SUBSTANCE INFORMATION: chemicals@airliquide.com**EMERGENCY PHONE:**

CHEMTREC: (U.S., Canada/ Puerto Rico) 1-800-424-9300 (24 hrs)

(International) +1-703-527-3887 (collect-24 hrs)

BUSINESS PHONE:

General SDS Information 1-972-301-5200 (8 am to 5 pm U.S. Central Time)

A NOTE: ALL United States Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards, Canadian WHMIS [Controlled Products Regulations], and Global Harmonization required information is included in appropriate sections based on the U.S. ANSI Z400.1-2008 format. This substance has been classified in accordance with the hazard criteria of the countries listed above.

2. HAZARD IDENTIFICATION

GLOBAL HARMONIZATION CLASSIFICATION: This product has been classified in accordance with the Global Harmonization Standard.Classification: Skin Corrosion Cat. 1B5, STOT (Ingestion/Inhalation/Skin Contact-Blood System) RE Cat. 2Signal Word: DangerHazard Statement Codes: H314, H373Precautionary Statements: P260, P264, P280, P301 + P330 + P331, P303 + P361 + P353 + P304 + P340, P310, P305 + P351 + P338, P363, P321, P405, P501Hazard Symbols/Pictograms: GHS05, GHS08

See Section 16 for full text of Classification

EMERGENCY OVERVIEW: Product Description: This product is a clear, pale yellow liquid with a pungent ammonia odor. **Health Hazards:** This product may cause moderate to severe irritation or burns by all routes of exposure, depending on concentration and duration of exposure. May be harmful or fatal if ingested or inhaled. Repeated low concentration inhalation may cause permanent damage to the respiratory system. Repeated low level skin exposure may cause dermatitis. The Ceric Ammonium Nitrate component can penetrate intact skin and may cause systemic effects by this route of exposure, including adversely affecting the ability of blood to carry oxygen, due to conversion of nitrates in body to nitrites. This hazard is also presented by ingestion and inhalation. **Flammability Hazards:** This solution is not flammable or combustible. If involved in a fire, this product may decompose to produce ammonia, cerium, nitrogen, carbon and sulfur oxides, oxygen, chlorine, chlorine oxides (predominantly chlorine dioxide, with some chlorine trioxide and chlorine tetroxide), hydrogen chloride. As this solution contains two strong oxidizers, if water is allowed to dry by heating, it may act as an oxidizer and cause fire when in contact with combustible materials. **Reactivity Hazards:** Heating this solution to high temperature may cause the Ceric Ammonium Nitrate component to dissociate forming nitric acid and ammonia; a strong exothermic reaction may be possible under conditions of high heating. **Environmental Hazards:** This product can damage contaminated plants and animals. All release to the environment should be avoided. **Emergency Response Considerations:** Emergency responders must wear personal protective equipment (and have appropriate fire-extinguishing protection) suitable for the situation to which they are responding.

3. COMPOSITION and INFORMATION ON INGREDIENTS

Chemical Name	CAS #	W/W%	LABEL ELEMENTS GHS Classification Hazard Statements
Perchloric Acid	7601-90-3	5.0-10.0%	<u>Classification:</u> Oxidizing Liquid. Cat. 1, Skin Corrosion Cat. 1A <u>Hazard Statement Codes:</u> H271, H314 <u>Hazard Symbols/Pictograms:</u> GHS03, GHS05

See Section 16 for full text of Ingredient Hazard and Precautionary Statements

3. COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

Chemical Name	CAS #	W/W%	LABEL ELEMENTS GHS Classification Hazard Statements
Ceric Ammonium Nitrate	16774-21-3	1.0-5.0%	SELF CLASSIFICATION: Classification: Oxidizing Solid Cat. 2, Skin Irritation Cat. 2, Serious Eye Damage/Irritation Cat. 1, Acute Oral Toxicity Cat. 5, Acute Dermal Toxicity Cat. 5, STOT (Ingestion/Inhalation/Skin Contact-Blood System) RE Cat. 2 Hazard Statement Codes: H272, H315, H318, H303 + H313, H373 Hazard Symbols/Pictograms: GHS03, GHS05, GHS08
Water	7732-18-5	Balance	Classification: Not Applicable

See Section 16 for full text of Ingredient Hazard and Precautionary Statements

4. FIRST-AID MEASURES

PROTECTION OF FIRST AID RESPONDERS: RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS MATERIAL WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. Rescuers should be taken for medical attention, if necessary. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

DESCRIPTION OF FIRST AID MEASURES: Victim(s) must be taken for medical attention. Take copy of label and SDS to physician or other health professional with victim(s). Remove victim(s) to fresh air, as quickly as possible.

Inhalation: If vapors, mists, or sprays are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. If adverse effect continues after removal to fresh air, seek medical attention.

Eye Exposure: If liquid or vapors enter the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 20 minutes. Do not interrupt flushing. If adverse effect occurs after flushing, seek medical attention.

Skin Exposure: If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 20 minutes. Do not interrupt flushing. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention if adverse effect occurs after decontamination.

Ingestion Exposure: If swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Rinse mouth with water immediately. Do NOT give water, as this may result in reaction. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing dermatitis, other skin conditions, inability of blood to carry adequate oxygen and respiratory problems may be aggravated by exposure to this product.

IMPORTANT SYMPTOMS AND EFFECTS: See Sections 3 (Hazard Identification) and 11 (Toxicological Information).

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT IF NEEDED: Treat symptoms and eliminate exposure. Provide oxygen, if necessary. Pulmonary function tests, chest X-rays, and nervous system evaluations may prove useful. Consultation with an ophthalmologist is recommended if eye exposure leads to tissue damage.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume): Not applicable.

FIRE EXTINGUISHING MEDIA: In the event of a fire, use suppression methods for surrounding materials (e.g., dry chemical, carbon dioxide, foam, any "ABC" class extinguisher).

UNSUITABLE FIRE EXTINGUISHING MEDIA: None known.

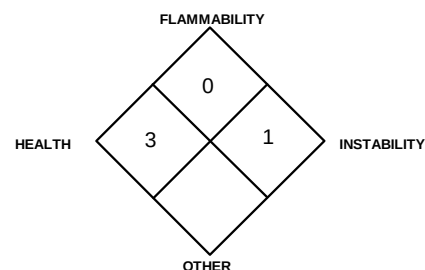
SPECIAL HAZARDS ARISING FROM THE SUBSTANCE: This solution is not flammable or combustible. If involved in a fire, this product may decompose to produce ammonia, cerium, nitrogen, carbon and sulfur oxides, oxygen, chlorine, chlorine oxides (predominantly chlorine dioxide, with some chlorine trioxide and chlorine tetroxide), hydrogen chloride. As this solution contains two strong oxidizers, if water is allowed to dry by heating, it may act as an oxidizer and cause fire in contact with combustible materials. If highly heated (as may occur during involvement in a fire), decomposition of the Perchloric Acid component to form chlorine, hydrogen chloride and chlorine dioxide, ammonia. In addition, involvement in fire may cause the Ceric Ammonium Nitrate component to dissociate forming nitric acid and ammonia; a strong exothermic reaction may be possible under conditions of high heating.

Explosion Sensitivity to Mechanical Impact: May be sensitive if stored for extended period due to possible formation of Perchloric Acid salts.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL PROTECTIVE ACTIONS FOR FIRE-FIGHTERS: Move containers from fire area if it can be done without risk to firefighters. Closed containers that are involved in a fire may rupture violently or explosively. Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. If this product is involved in a fire, fire run-off water should be contained to prevent possible environmental damage. All contaminated equipment must be thoroughly cleaned with a neutralizer suitable for and rinsed with water before such equipment is returned to service.

NFPA RATING



6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS AND EMERGENCY PROCEDURES: If a release occurs, evacuate area. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a large spill, clear the affected area, protect people, and respond with trained personnel. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Decontaminate the area thoroughly. Call CHEMTREC (1-800-424-9300) for emergency assistance. Or if in Canada, call CANUTEC (613-996-6666). The atmosphere must have levels of the components of this product lower than those listed in Section 8, (Exposure Controls, Personal Protection), if applicable, and at least 19.5 percent oxygen before personnel can be allowed into the area without Self-Contained Breathing Apparatus (SCBA).

PERSONAL PROTECTIVE EQUIPMENT: Proper protective equipment should be used. See below for specific information.

ALL Spills: Minimum Personal Protective Equipment should be rubber gloves, rubber boots, face shield, and Tyvek suit. The minimum level of personal protective equipment for all releases must be **Level B: triple-gloves (fire-retardant gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard hat, and Self-Contained Breathing Apparatus. A fire retardant suit must be worn over the chemical resistant suit.**

METHODS FOR CLEAN-UP AND CONTAINMENT:

Small Spills: Absorb spilled liquid with polypads or other suitable absorbent materials. Neutralize residue with sodium bicarbonate, soda ash, slaked lime or other appropriate neutralizing agent for acids. Place spilled material in appropriate container for disposal, sealing tightly. Remove all residues before decontamination of spill area. Purge equipment with inert gas prior to reuse.

Spills in Hoods: Decontamination of all interior hood surfaces may be required after the above procedures for small spills have been followed. If the HEPA filter of a hood is contaminated, the unit must be labeled "Do not use-contaminated" and the filter must be changed and disposed of properly as soon as possible by trained personnel wearing protective equipment. Protective goggles should be cleaned with an alcohol wipe after the cleanup.

Large Spills: Access to the spill area should be restricted. Spread should be limited diking spill area. Absorb spilled liquid with polypads or other suitable absorbent materials. Neutralize residue with sodium bicarbonate, soda ash, slaked lime or other appropriate neutralizing agent for acids. Monitor the surrounding area for oxygen levels. The atmosphere must have at least 19.5 % oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus.

All Spills: Do not allow spill residue to dry as it may then become an oxidizing residue which can react with combustible materials and cause fire. Place all spill residues in a double plastic bag or other containment and seal. Decontaminate the area thoroughly. Test area with litmus paper to ensure neutralization is complete. Do not mix with wastes from other materials. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations). For spills on water, contain, minimize dispersion and collect. Dispose of recovered material and report spill per regulatory requirements.

ENVIRONMENTAL PRECAUTIONS: Avoid release to the environment. Run-off water may be contaminated by other materials and should be contained to prevent possible environmental damage.

REFERENCE TO OTHER SECTIONS: See information in Section 8 (Exposure Controls – Personal Protection) and Section 13 (Disposal Considerations) for additional information.

7. HANDLING and USE

PRECAUTIONS FOR SAFE HANDLING: ALL AREAS WHERE THIS PRODUCT IS USED SHOULD CONTAIN INSTANT ACTING SHOWERS IN EVENT OF CONTAMINATION. All employees who handle this material should be trained to handle it safely. Minimize all exposure to this substance. As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing vapors or mists generated by this product. Use in a well-ventilated location, segregated from other materials and operations. Containers of this product must be properly labeled. Empty containers may contain residual liquid or vapors; therefore, empty containers should be handled with care. There may be a slight build-up of pressure in the container; therefore, the container should be opened slowly.

CONDITIONS FOR SAFE STORAGE: Keep container tightly closed when not in use. Glass, ceramic or polyethylene containers are recommended for solutions containing Perchloric Acid. Do not allow solution to evaporate to dryness. Dried residue which comes into contact with combustible material may cause fire. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Prolonged storage may cause formation of perchloric acid salts, which can be shock-sensitive. Containers should be not be subjected to a temperature higher than 49°C (120°F). Material should be stored in secondary containers or in a diked area, as appropriate. Keep absorbents or neutralizers for leaks and spills readily available. Contain spills or leaks by storing in trays made from compatible materials such as glass or porcelain. Wipe the trays periodically. Provide raised sills or ramps at doorways or create a trench which drains to a safe location. Floors should be watertight and without cracks. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Storage areas should be made of corrosion-resistant materials. Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged. Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Have appropriate extinguishing equipment in the storage area (such as sprinkler systems or portable fire extinguishers).

SPECIFIC END USE(S): This product is used in metal etching applications. Follow all industry standards for use of this product.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment thoroughly, before maintenance begins. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/CONTROL PARAMETERS:

Ventilation and Engineering Controls: This product should be used with adequate ventilation at all times. Use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits provided in this section, if applicable. Use corrosion-resistant local exhaust ventilation, separate from other ventilation system along with enclosure (perchloric acid fume hood). Ventilation systems specifically designed for exhausting perchloric acid mist and vapor must be used. This system should have a functioning wash-down system. Flush the system for at least 20-30 minutes at the end of each work session. Exhaust system in manner consistent with prevention of release to atmosphere. An appropriate preventative maintenance program to prevent the accumulation of explosive perchloric acid salts in the ventilation hood and ducting should be developed and strictly followed. Consider testing to determine if acid or salts (perchlorates) are building up on surfaces including the inside of the ventilation system. An eyewash and safety drench shower should be readily accessible.

Occupational/Workplace Exposure Limits/Guidelines:

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR							
		ACGIH-TLVs		OSHA-PELs		NIOSH-RELs		NIOSH IDLH ppm	OTHER ppm
		TWA ppm	STEL ppm	TWA ppm	STEL ppm	TWA ppm	STEL ppm		
Ceric Ammonium Nitrate	16774-21-3	NE	NE	NE	NE	NE	NE	NE	NE
Perchloric Acid	7601-90-3	NE	NE	NE	NE	NE	NE	NE	NE
Water	7732-18-5	NE	NE	NE	NE	NE	NE	NE	NE

NE = Not Established.

PERSONAL PROTECTIVE EQUIPMENT: The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I, beginning at 1910.132, including the Respiratory Protection Standard (29 CFR 1910.134), the Eye Protection Standard (29 CFR 1910.133), the Hand Protection Standard (29 CFR 1910.138), and Foot Protection (29 CFR 1910.136) or the Canadian CSA Standard Z94.4-M1982, Selection, Care and Use of Respirator, the CSA Standard Z94.3-02, Industrial Eye and Face Protectors, and the Canadian CSA Standard Z195-02, Protective Footwear. Please reference applicable regulations and current standards for relevant details.

Respiratory Protection: Maintain airborne contaminant concentrations below limits listed above. In instances where inhalable mists or sprays of product may be generated, and respiratory protection is necessary, use only respiratory protection authorized in the U.S. Federal OSHA, or equivalent U.S. State standards, and standard of Canada. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, SAR with auxiliary self-contained air supply is required under U.S. OSHA's Respiratory Protection Standard.

Eye Protection: Use approved safety goggles or safety glasses with side shields worn with a face shield to prevent liquid splash contact. If necessary, refer to U.S. OSHA and Canadian Standards.

Hand Protection: Recommended gloves are Butyl rubber, Natural rubber, Neoprene rubber, Nitrile rubber, Polyvinyl chloride, Tychem(R) BR/LV, Tychem(R) Responder(R), Tychem(R) TK. Due to severe skin contact hazard, do not use thin gloves of any type (0.3 mm or less), including latex, polyvinyl alcohol or similar gloves. Double-gloving is recommended as well as triple gloves for spill response. All gloves should be leak-tested prior to use. If necessary, refer to appropriate Standards.

Body Protection: When chemical contact is possible, use splash apron, work uniform, and shoes or coverlets to prevent skin contact. An apron or other impermeable body protection is suggested. Full-body chemical protective clothing is recommended for emergency response procedures. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA and Canadian Standards.

9. PHYSICAL and CHEMICAL PROPERTIES

FORM: Liquid.

MOLECULAR FORMULA: Mixture.

ODOR: Pungent, ammonia-like.

VAPOR DENSITY (water = 1): Not available.

BOILING POINT: Not available.

SPECIFIC GRAVITY (water = 1): 1.05

SOLUBILITY IN WATER: Soluble.

EVAPORATION RATE (n-BuAc = 1): < 1

SPECIFIC VOLUME: Not applicable.

LOG COEFFICIENT WATER/OIL DISTRIBUTION: Not determined.

HOW TO DETECT THIS SUBSTANCE (warning properties): The odor and color may be a characteristic property in event of an accidental release.

COLOR: Clear to light-yellow.

MOLECULAR WEIGHT: Mixture.

ODOR THRESHOLD: Not available.

PERCENT VOLATILE BY VOLUME: Not available.

FREEZING/MELTING POINT: Not available.

pH: < 1

OTHER SOLUBILITIES: Not available.

EXPANSION RATIO Not applicable.

VAPOR PRESSURE: Not determined.

10. STABILITY and REACTIVITY

CHEMICAL STABILITY: Stable at standard temperatures and pressures. Allowing water in solution to evaporate may result in residue that is strongly oxidizing; exposure such residue to combustible materials may cause fire. Heating to high temperature may cause decomposition of the Perchloric Acid component to form toxic chlorine, hydrogen chloride and chlorine dioxide.

DECOMPOSITION PRODUCTS: Combustion: Ammonia, cerium, nitrogen, carbon and sulfur oxides, oxygen, chlorine, chlorine oxides (predominantly chlorine dioxide, with some chlorine trioxide and chlorine tetroxide), hydrogen chloride. Hydrolysis: None known.

10. STABILITY and REACTIVITY (Continued)

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product is incompatible with strong reducing agents, and powdered metals, dehydrating agents (e.g. sulfuric acid, phosphorus pentoxide, phosphoric acid, acetic anhydride, acetic acid, alcohols (e.g. ethanol or methanol), bases (e.g. sodium or potassium hydroxide), fluorine, trichloroethylene, acetonitrile, dimethyl ether, phosphine, pyridine or nitric acid and organic matter (e.g. vegetable oil, milk, plant material), glycols (e.g. ethylene glycol), glycol ethers (e.g. 2-ethoxyethanol), glycerol, diethyl ether or ketones, antimony compounds (trivalent) or bismuth, steel, hydriodic acid, sodium iodide or sulfinyl chloride, hypophosphites (e.g. sodium hypophosphite) or reducing agents (e.g. charcoal or sodium phosphinate), organic sulfoxides (e.g. dimethyl sulfoxide or dibutyl sulfoxide), nitrogen triiodide or nitrosophenol, aniline and formaldehyde due to incompatibility of components. May react violently with metal powders, with risk of fire and explosion. May corrode containers and some plastics.

POSSIBILITY OF HAZARDOUS REACTIONS/POLYMERIZATION: Polymerization will not occur. Subjecting this solution to high temperature may cause the Ceric Ammonium Nitrate component to dissociate forming nitric acid and ammonia; a strong exothermic reaction may be possible under conditions of high heating.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to extreme temperatures.

11. TOXICOLOGICAL INFORMATION

SYMPTOMS OF EXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of occupational exposure to this product via inhalation and contact with the skin or eyes. The symptoms of exposure to this product, via route of entry, are as follows:

Inhalation: If vapors, mists or sprays of this solution are inhaled, symptoms of exposure may include breathing difficulty, irritation of the mucus membranes, coughing, nasal congestion, and a sore throat. Damage to the tissues of the respiratory system may also occur, especially after prolonged exposure or exposure to high concentrations of this solution. The effects of inhalation exposure may be delayed up to 48 hours. Severe inhalation exposure can lead to chemical pneumonitis, pulmonary edema, and death. Repeated, low level exposure can cause damage to the respiratory system, including emphysema. Inhalation of large amounts may cause systemic acidosis or adverse blood effects (see information under 'Other Health Effects').

Contact with Skin or Eyes: This solution is corrosive and is capable of causing severe burns with deep ulceration and permanent scarring. Repeated skin exposure to low level concentrations may cause dermatitis (dry, red skin). Contact with the eyes will lead to severe irritation or burns. The severity of injury increases with the concentration of the solution, the duration of exposure, and the speed of penetration into the eye. Damage can range from severe irritation and mild scarring to blistering, disintegration, ulceration, severe scarring and clouding. In severe cases, there is progressive ulceration and clouding of eye tissue which may lead to permanent blindness.

Skin Absorption: Both the Perchloric Acid and Ceric Ammonium Nitrate components may be absorbed via intact skin, causing systemic toxicity if contact is prolonged. Refer to 'Other Health Effects' for more information.

Ingestion: Ingestion is not anticipated to be a likely route of occupational exposure. If this product is swallowed, it will irritate and burn the mouth, throat, esophagus, and other tissues of the digestive system. Symptoms may include pain, vomiting, diarrhea, nausea, salivation, hemorrhagic gastroenteritis, muscular weakness, tremors, convulsions, vascular collapse and collapse. Chronic ingestion of more than 5 mg/kg/day of ammonium nitrate compounds (such as the Ceric Ammonium Nitrate component) is considered unacceptable. Primary overdose effects include orthostatic hypotension and methemoglobinemia. Orthostatic hypotension, faintness, fatigue, weakness, depression, mental impairment, dizziness, shortness of breath, and reflex tachycardia are common; headache, nausea and vomiting may also occur. Chronic ingestion may also cause nephritis. Severe ingestion exposure may be fatal.

Injection: Accidental injection of this product, via laceration or puncture by a contaminated object, may cause pain and irritation in addition to the wound.

Other Health Effects: Exposure by ingestion or prolonged inhalation or skin contact may cause systemic toxicity. Exposure by these routes may cause systemic acidosis or methemoglobinemia. Methemoglobinemia is the inability of the blood to carry sufficient oxygen, resulting in cyanosis (oxygen starved cells). Symptoms of methemoglobinemia include cyanosis (blue lips, eyelids, earlobes, and skin), headache, fatigue, weakness, convulsions, dizziness, loss of coordination, nausea, vomiting, difficulty breathing, and drowsiness. It may also affect the cardiovascular system and cause increased or decreased heart rate, and low blood pressure. This effect is caused by the conversion in the body of nitrates (from the Ceric Ammonium Nitrate component) to nitrites.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Exposure to this product may cause the following health effects:

Acute: This product may cause severe irritation or burns by all routes of exposure. Severe inhalation and ingestion exposure can be fatal due to corrosivity. Eye contact may cause blindness. Skin absorption may be harmful.

Chronic: Prolonged or repeated skin exposure to this product can cause dermatitis (dry, red skin). Chronic inhalation exposure can cause dental erosion and perforation of the nasal septum, as well as permanently disable the respiratory system. Chronic ingestion, inhalation and exposure by skin contact may cause systemic acidosis and an inability of the blood to carry oxygen.

TARGET ORGANS: Acute: Skin, respiratory system, eyes, blood system. Chronic: Skin, respiratory system, blood system.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	3*
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FLAMMABILITY HAZARD	(RED)	0
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PHYSICAL HAZARD	(YELLOW)	1
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PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		SEE SECTION 8

For Routine Industrial Use and Handling Applications

11. TOXICOLOGICAL INFORMATION (Continued)

TOXICITY DATA: The following toxicology data are for components of this product greater than 1%. No data are available for the Ceriic Ammonium Nitrate component.

PERCHLORIC ACID:

LD₅₀ (Oral-Rat) 1100 mg/kg; Behavioral: excitement; Lungs, Thorax, or Respiration: dyspnea; Nutritional and Gross Metabolic: body temperature decrease

LD₅₀ (Oral-Rat) 1100 mg/kg

LD₅₀ (Oral-Dog) 400 mg/kg; Behavioral: excitement; Lungs, Thorax, or Respiration: dyspnea Nutritional and Gross Metabolic: body temperature decrease

LD₅₀ (Oral-Dog) 400 mg/kg

PERCHLORIC ACID (continued):

LD₅₀ (Subcutaneous-Mouse) 250 mg/kg; Behavioral: excitement; Lungs, Thorax, or Respiration: dyspnea; Nutritional and Gross Metabolic: body temperature decrease

TDLo (Oral-Rat) 1.4 mg/kg/14 days-intermittent: Endocrine: evidence of thyroid hypofunction

CARCINOGENIC POTENTIAL OF COMPONENTS: No component of this product is not found on the following lists: U.S. OSHA, U.S. EPA, NIOSH, NTP, IARC, and GERMAN MAK and therefore are neither considered to be nor suspected to be cancer causing agents by these agencies. It should be noted, however, Nitrates can be reduced to nitrites in the body, and the formed nitrites can subsequently react with amines to form suspect carcinogens N-nitrosamines.

IRRITANCY OF PRODUCT: The liquid or vapors of this product may be moderately to severely irritating or cause burns, depending on concentration and duration of exposure.

SENSITIZATION TO THE PRODUCT: The components of this solution are not known to cause skin or respiratory sensitization effects in humans.

REPRODUCTIVE TOXICITY INFORMATION: The following information is available for components of this solution.

Mutagenicity: No genetic effects are specifically available for components. However, in general, nitrates and nitrites are considered to be genotoxic.

Embryotoxicity/Teratogenicity: There has been some association between consumption of nitrate-contaminated well water and birth defects, especially neural tube defects. However, these studies may not be specifically related to the Ceriic Ammonium Nitrate component.

Reproductive Toxicity: No information available.

ACGIH BIOLOGICAL EXPOSURE INDICES: Currently, no ACGIH Biological Exposure Indices (BEIs) have been determined for the components of this product.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

MOBILITY: This product has not been tested for mobility in soil. No specific information is available for components. It is expected to be somewhat mobile due to high water content.

PERSISTENCE AND BIODEGRADABILITY: This product has not been tested for persistence or biodegradability. No specific information is available for components. It is expected that this material will be degraded over time into other organic compounds. Rapid volatilization from soils is anticipated.

BIO-ACCUMULATION POTENTIAL: This product has not been tested for bio-accumulation potential. No specific information is available for components.

ECOTOXICITY: This product has not been tested for aquatic or animal toxicity. All release to terrestrial, atmospheric and aquatic environments should be avoided. No aquatic toxicity data are available for components.

OTHER ADVERSE EFFECTS: This material is not expected to have any ozone depletion potential.

ENVIRONMENTAL EXPOSURE CONTROLS: Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

13. DISPOSAL CONSIDERATIONS

WASTE TREATMENT/DISPOSAL METHODS: It is the responsibility of the generator to determine at the time of disposal whether the product meets the criteria of a hazardous waste per regulations of the area in which the waste is generated and/or disposed of. Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Shipment of wastes must be done with appropriately permitted and registered transporters.

DISPOSAL CONTAINERS: Waste materials must be placed in and shipped in appropriate 5-gallon or 55 gallon poly or metal waste pails or drums. Permeable cardboard containers are not appropriate and should not be used. Ensure that any required marking or labeling of the containers be done to all applicable regulations.

PRECAUTIONS TO BE FOLLOWED DURING WASTE HANDLING: Wear proper protective equipment when handling waste materials. Dispose of in accordance with applicable Federal, State, and local procedures and standards.

U.S. EPA WASTE NUMBER: Wastes from this product should be tested to see if they meet D002 (Waste Characteristic-Corrosivity).

14. TRANSPORTATION INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION REGULATIONS: This product is classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

UN IDENTIFICATION NUMBER:

UN 3264

PROPER SHIPPING NAME:

Corrosive liquids, acidic, inorganic, n.o.s. (Perchloric Acid, Ceriic Ammonium Sulfate)

HAZARD CLASS NUMBER and DESCRIPTION:

8 (Corrosive)

PACKING GROUP:

III

DOT LABEL(S) REQUIRED:

Class 8 (Corrosive)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2012): 154

14. TRANSPORTATION INFORMATION (Continued)

U.S. DEPARTMENT OF TRANSPORTATION REGULATIONS (continued):

MARINE POLLUTANT: The components of this product are not classified by the DOT as a Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This product is classified as Dangerous Goods, per regulations of Transport Canada.

UN IDENTIFICATION NUMBER: UN 3264
PROPER SHIPPING NAME: Corrosive liquids, acidic, inorganic, n.o.s. (Perchloric Acid, Ceric Ammonium Sulfate)
HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive)
PACKING GROUP: III
HAZARD SHIPPING LABEL(S) REQUIRED: Class 8 (Corrosive)
SPECIAL PROVISIONS: 16
EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX: 5
ERAP INDEX: None
PASSENGER CARRYING SHIP INDEX: None
PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX: 5

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This product is classified as dangerous goods, per the International Air Transport Association.

UN IDENTIFICATION NUMBER: UN 3264
PROPER SHIPPING NAME/DESCRIPTION: Corrosive liquids, acidic, inorganic, n.o.s. (Perchloric Acid, Ceric Ammonium Sulfate)
HAZARD CLASS or DIVISION: 8 (Corrosive)
HAZARD LABEL(S) REQUIRED: Class 8 (Corrosive)
PACKING GROUP: III
EXCEPTED QUANTITIES: E1
PASSENGER and CARGO AIRCRAFT PACKING INSTRUCTION: 852
PASSENGER and CARGO AIRCRAFT MAXIMUM NET QUANTITY PER PKG: 5 L
PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY PACKING INSTRUCTION: Y841
PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY MAXIMUM NET QUANTITY PER PKG: 1 L
CARGO AIRCRAFT ONLY PACKING INSTRUCTION: 856
CARGO AIRCRAFT ONLY MAXIMUM NET QUANTITY PER PKG: 60 L
SPECIAL PROVISIONS: A3, A803
ERG CODE: 8L

15. REGULATORY INFORMATION

ADDITIONAL UNITED STATES REGULATIONS:

U.S. SARA Reporting Requirements: The components of this product are subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Ceric Ammonium Nitrate (as a dissociable nitrate compound)	No	No	Yes-Category N511

U.S. SARA SECTION 302 Extremely Hazardous Substance Threshold Planning Quantity (TPQ): Not applicable.

U.S. SARA SECTION 304 Extremely Hazardous Reportable Quantity (RQ): Not applicable.

U.S. EPA TRI Threshold Planning Quantity (TPQ): Mfg. or Import: 25,000 lb (11,350 kg); Use: 10,000 lb (4,540 kg)

U.S. CERCLA Reportable Quantity (RQ): Not applicable.

U.S. Clean Air Act (CA 112r) Threshold Quantity (TQ): Not applicable.

U.S. TSCA Inventory Status: The components of this product are listed on the TSCA Inventory.

U.S. SARA Hazard Categories (Section 311/312, 40 CFR 370-21): ACUTE: Yes; CHRONIC: Yes; FIRE: No; REACTIVE: No; SUDDEN RELEASE: No

Other U.S. Federal Regulations: Not applicable.

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65): The components of this product are not on the California Proposition 65 lists.

ADDITIONAL CANADIAN REGULATIONS:

Canadian DSL/NDL Inventory Status: The components of this product are on the DSL Inventory.

Canadian Environmental Protection Act (CEPA) Priorities Substances Lists: No component of this product is on the CEPA Priorities Substances Lists.

Canadian WHMIS Classification and Symbols: This product is classified as a Controlled Product, Hazard Classes E (Corrosive), and D2B (Chronic Toxic Effects) as per the Controlled Product Regulations.



16. OTHER INFORMATION

GLOBAL HARMONIZATION SYSTEM CLASSIFICATION:

Classification: Skin Corrosion Category 1B, Specific Organ Toxicity (Ingestion/Inhalation/Skin Contact-Blood System) Repeated Exposure Category 2

Signal Word: Danger

Hazard Statements: H314: Causes severe skin burns and eye damage. H373: May cause damage to ability of blood to carry oxygen through prolonged or repeated exposure.

Precautionary Statements:

Prevention: P260: Do not breathe gas/mist/vapors/spray. P264: Wash contaminated tissues after handling. P280: Wear protective gloves, clothing, eye protection and face protection.

Response: P301 + P330 + P331: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. P303 + P361 + P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. P305 + P351 + P338 + P310: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P304 + P340 + P310: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor. P363: Wash contaminated clothing before reuse. P321: Specific treatment (remove from exposure and treat symptoms).

Storage: P405: Keep locked-up.

Disposal: P501: Dispose of contents/containers in accordance with all local, regional, national and international regulations.

Hazard Symbol: GHS05, GHS08

REFERENCES AND DATA SOURCES: Contact the supplier for information.

METHODS OF EVALUATING INFORMATION FOR THE PURPOSE OF CLASSIFICATION: Bridging principles were used to classify this product.

REVISION DETAILS: New.

MIXTURES: When two or more chemicals are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for this product before you use the product. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember all chemicals have properties that can cause serious injury or death.

REVISION INFORMATION: New

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AIR LIQUIDE

This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this product. To the best of Air Liquide America Electronics Chemicals & Services Inc.'s knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this product is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.