



# MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

## PART I *What is the material and what do I need to know in an emergency?*

### 1. PRODUCT IDENTIFICATION

**TRADE NAME (AS LABELED):** **CALCIUM NITRITE SOLUTION**  
**CHEMICAL NAME/CLASS:** Inorganic Nitrite Solution  
**PRODUCT USE:** Corrosion Inhibitor  
**SUPPLIER/MANUFACTURER'S NAME:** **MINERAL RESEARCH AND DEVELOPMENT**  
**ADDRESS:** 200 East Woodlawn Road  
One Woodlawn Green – Suite 250  
Charlotte, NC 28217  
**EMERGENCY PHONE:** CHEMTREC: 1-800-424-9300  
**BUSINESS PHONE:** 1-704-525-2771  
**MSDS PREPARATION DATE:** January 30, 2003

### 2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% v/v	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH IDLH mg/m <sup>3</sup>	OTHER mg/m <sup>3</sup>
			TLV mg/m <sup>3</sup>	STEL mg/m <sup>3</sup>	PEL mg/m <sup>3</sup>	STEL mg/m <sup>3</sup>		
Calcium Nitrite	13780-06-8	30%	NE	NE	NE	NE	NE	NE
Calcium Nitrite Tetrahydrate	10124-37-5	< 5%	NE	NE	NE	NE	NE	NE
Water	7732-18-5	Balance	NE	NE	NE	NE	NE	NE

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

### 3. HAZARD IDENTIFICATION

**EMERGENCY OVERVIEW:** This product is a clear, light-yellow to colorless solution, with a slight sweet odor. The primary health hazard associated with this product is the potential for moderate irritation of respiratory system, eyes, skin, and other contaminated tissue. Inhalation and ingestion of this product can lead to adverse effects on the blood, including cyanosis and methemoglobinemia. This product would have to be substantially heated for ignition to occur. If allowed to evaporate to dryness, the residue may act as an oxidizer to initiate and sustain the combustion of flammable materials. This product is not reactive. Emergency responders must wear the personal protective equipment suitable for the situation to which they are responding.

**SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE:** The primary routes of industrial overexposure for the solution are via inhalation and contact with skin and eyes. The following paragraphs describe the symptoms of overexposure to this material.

**INHALATION:** If vapors, mists, or sprays of this product are inhaled, moderate irritation to the nose, throat, and lungs can occur. Symptoms from low level concentration inhalation may include sneezing, coughing, and difficulty breathing. Exposure to higher concentration may result in drowsiness, nausea, vomiting, irregular heartbeat, fall in blood pressure and dizziness. Most symptoms from acute exposure are generally alleviated when the overexposure ends. Overexposure to high concentrations or prolonged exposure can result in damage to respiratory system tissues, convulsions, methemoglobinemia and cyanosis (as described under "Ingestion").

### 3. HAZARD IDENTIFICATION (Continued)

**CONTACT WITH SKIN or EYES:** Depending on the duration of skin contact, skin overexposures will cause reddening, discomfort, moderate irritation, and tissue damage. Dermatitis may result from prolonged or repeated skin contact. Prolonged skin contact may also cause cyanosis. Depending on the duration of over-exposure, contact with the eyes will cause irritation, pain, and reddening. Severe eye exposure can cause conjunctivitis. Severe, prolonged exposures may cause tissue damage which could lead to blindness.

**SKIN ABSORPTION:** Although no data is available for components of this product, absorption of inorganic nitrite compounds may cause methemoglobinemia, as described under "Ingestion".

**INGESTION:** If this product is swallowed, irritation and burns of the mouth, throat, esophagus, and other tissues of the digestive system will occur immediately upon contact. Symptoms of such over-exposure can include nausea, abdominal pain, vomiting, and diarrhea. Severe ingestion overexposures can result in convulsion, collapse and coma. Ingestion of this product may damage the oxygen transport system of the blood (methemoglobinemia), causing observable cyanosis of lips, nose, earlobe, euphoria, headache, flushed face. In severe cases of cyanosis, weakness, dizziness, lightheadedness, fall in blood pressure, increasingly severe headaches, ataxia, shallow respiration, confusion, lethargy, stupor, tachycardia, convulsions, coma or can be fatal. Repeated ingestion of small amounts of this product (as may occur in the event of poor hygiene practices) may lead to a chronic form of methemoglobinemia.




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

**HEALTH EFFECTS OR RISKS FROM EXPOSURE:** An Explanation in **Lay Terms**. In the event of over-exposure, the following symptoms may be observed:

**ACUTE:** The primary hazard associated with this product is the potential for moderate irritation of skin, eyes, and other contaminated tissue. Prolonged contact can result in tissue damage. Ingestion of this product can be harmful or fatal. Overexposure to this product by inhalation, skin contact and ingestion may result in adverse effects on the ability of blood to carry oxygen (methemoglobinemia).

**CHRONIC:** Dermatitis (inflammation and redness of the skin) may result from prolonged or repeated skin contact. Repeated inhalation and ingestion of this product may adverse effects on the ability of blood to carry oxygen (methemoglobinemia).

**TARGET ORGANS:** ACUTE: Skin, eyes, respiratory system, blood. CHRONIC: Skin, blood.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH		(BLUE)	3
FLAMMABILITY		(RED)	1
REACTIVITY		(YELLOW)	0
PROTECTIVE EQUIPMENT			D
EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		

For routine industrial applications  
**See Section 16 for Definition of Ratings**

## PART II What should I do if a hazardous situation occurs?

### 4. FIRST-AID MEASURES

Contaminated individuals must be taken for medical attention if any adverse reaction occurs. Rescuers should be taken for medical attention, if necessary. Take a copy of label and MSDS to health professional with contaminated individual.

**SKIN EXPOSURE:** If this product contaminates the skin, begin decontamination with running water. The minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention if any adverse effect occurs.

**EYE EXPOSURE:** If liquid or vapors from this product enter the eyes, open contaminated individual's eyes while under gently running water. Use sufficient force to open eyelids. Have contaminated individual "roll" eyes. Minimum flushing is for 15 minutes. Contaminated individual must seek immediate medical attention.

**INHALATION:** If vapors, mists, or sprays of this product are inhaled, remove contaminated individual to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

**INGESTION:** If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Have victim rinse mouth with water or drink several cupfuls of water, if conscious. Never induce vomiting or give a diluent (e.g., water) to someone who is unconscious, having convulsions, or unable to swallow. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration.

## 4. FIRST-AID MEASURES (Continued)

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** Pre-existing dermatitis, or other skin disorders, and conditions involving the other Target Organs (See Section 3, Hazard Identification) may be aggravated by over-exposure to this product.

**RECOMMENDATIONS TO PHYSICIANS:** Treat symptoms and eliminate overexposure. Keep patient recumbent in a shock position and comfortably warm. If exposure was via ingestion, administer gastric lavage with tap water or with 1:5000 solution of potassium permanganate. Administer oxygen and artificial ventilation, if necessary. If methemoglobinemia level is significant, the administration of methylene blue is indicated. Administer a 1% solution of methylene blue in a dose of 1 to 2 mg/kg intravenously. If necessary, the use of whole blood or plasma expander transfusion may be helpful. Avoid the use of epinephrine and other vasoconstrictor drugs. In less severe cases of methemoglobinemia, administer 5 mg/kg orally.

## 5. FIRE-FIGHTING MEASURES

**FLASH POINT:** > 93°C (> 200°F)

**AUTOIGNITION TEMPERATURE:** Not determined.

**FLAMMABLE LIMITS (in air by volume, %):** Lower (LEL): Not applicable.  
Upper (UEL): Not applicable.

**FIRE EXTINGUISHING MATERIALS:**

**Water Spray:** YES

**Foam:** YES

**Halon:** YES

**Carbon Dioxide:** YES

**Dry Chemical:** YES

**Other:** Any "ABC" Class.

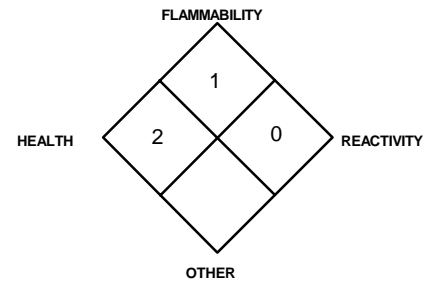
**UNUSUAL FIRE AND EXPLOSION HAZARDS:** This product is a moderate irritant and presents a potential contact hazard to firefighters. When involved in a fire, this material may decompose and produce acrid vapors, oxides of calcium and oxides of nitrogen. If allowed to evaporate to dryness, the residue will be an oxidizer which can act to initiate and sustain the combustion of flammable materials.

**Explosion Sensitivity to Mechanical Impact:** Not sensitive.

**Explosion Sensitivity to Static Discharge:** Not sensitive.

**SPECIAL FIRE-FIGHTING PROCEDURES:** Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Chemical resistant clothing may be necessary. Move containers from fire area if they have not been exposed to heat and if it can be done without risk to personnel. If this product is involved in a fire, fire run-off water should be contained to prevent possible environmental damage. Rinse all contaminated equipment thoroughly with water before returning to service.

### NFPA RATING



**See Section 16 for  
Definition of Ratings**

## 6. ACCIDENTAL RELEASE MEASURES

**SPILL AND LEAK RESPONSE:** 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, and protect people. In the event of a non-incident release (e.g., 55-gallon release in which excessive splashes or sprays can be generated), minimum Personal Protective Equipment should be Level C: triple-gloves (rubber gloves and nitrile gloves, over latex gloves), chemically resistant suit and boots, hard-hat, and an air-purifying respirator with a high-efficiency particulate filter. Level B, which includes Self Contained Breathing Apparatus, must be worn in situations in which excessive sprays or mists can be generated, or the oxygen level is less than 19.5% or unknown. Absorb spilled liquid with polypads or other suitable absorbent materials (do not use activated carbon). Decontaminate the area thoroughly. Place all spill residue in a suitable container and seal. Dispose of in accordance with U.S. Federal, State, and local waste disposal regulations, or the applicable Canadian standards (see Section 13, Disposal Considerations).

## PART III *How can I prevent hazardous situations from occurring?*

## 7. HANDLING and STORAGE

**WORK PRACTICES AND HYGIENE PRACTICES:** As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash hands after handling this product. Do not eat, drink, smoke or apply cosmetics while handling this product. All work practices should minimize the generation of splashes and aerosols. Remove contaminated clothing immediately.

## 7. HANDLING and STORAGE (Continued)

**STORAGE AND HANDLING PRACTICES:** All employees who handle this material should be trained to handle it safely. Avoid breathing vapors or mists generated by this product. Use in a well-ventilated location. Open containers slowly, on a stable surface. Containers of this product must be properly labeled. Empty containers may contain residual liquid or vapors therefore, empty containers should be handled with care. Do not allow this solution to evaporate to dryness, which will create a hazard of combustion. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store away from incompatible materials (see Section 10, Stability and Reactivity). Material should be stored in secondary containers, or in a diked area, as appropriate. Keep container tightly closed when not in use. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged.

**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, if necessary. Collect all rinsates and dispose of according to applicable U.S. Federal, State, or local procedures, or the appropriate Canadian Standards.

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## 8. EXPOSURE CONTROLS - PERSONAL PROTECTION

**VENTILATION AND ENGINEERING CONTROLS:** Exhaust directly to the outside. Use local exhaust ventilation, and process enclosure if necessary, to control mist formation. Supply sufficient replacement air to make up for air removed by system. Ensure eyewash/safety shower stations are available near areas where this product is used.

**RESPIRATORY PROTECTION:** Maintain airborne contaminant concentrations below guidelines listed in Section 2 (Composition and Information on Ingredients) if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent U.S. State standards, and Canadian CSA Standard Z94.4-93. 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, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

**EYE PROTECTION:** Splash goggles or safety glasses. Face shields recommended when using quantities of this product in excess of 1 gallon. If necessary, refer to U.S. OSHA 29 CFR 1910.133.

**HAND PROTECTION:** Wear Neoprene or Rubber gloves for routine industrial use. Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS.

**BODY PROTECTION:** Use body protection appropriate for task. An apron, or other impermeable body protection is suggested. Full-body chemical protective clothing is recommended for emergency response procedures.

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## 9. PHYSICAL and CHEMICAL PROPERTIES

**VAPOR DENSITY:** 1.0

**SPECIFIC GRAVITY:** 1.27-1.33

**SOLUBILITY IN WATER:** Complete

**VAPOR PRESSURE:** Not applicable.

**ODOR THRESHOLD:** Not determined.

**LOG WATER/OIL DISTRIBUTION COEFFICIENT:** Not available.

**APPEARANCE AND COLOR:** This product is a clear, light-yellow to colorless solution, with a slight sweet odor.

**HOW TO DETECT THIS SUBSTANCE (warning properties):** There are no distinguishing characteristics of this product.

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**EVAPORATION RATE (n-BuAc=1):** 0.16.

**FREEZING POINT or RANGE:** Not determined.

**BOILING POINT:** ~108°C (~226°F)

**pH:** 8.0-9.5

**PERCENT VOLATILE:** 65-70% (as water)

## 10. STABILITY and REACTIVITY

**STABILITY:** Stable under conditions of normal temperature and pressure.

**DECOMPOSITION PRODUCTS:** Oxides of calcium and nitrogen.

**MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE:** Ammonium salts, activated carbon, reducing agents, cyanides. Residue would be incompatible with combustible materials.

**HAZARDOUS POLYMERIZATION:** Will not occur.

**CONDITIONS TO AVOID:** Extreme heat and contact with incompatible chemicals.

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## PART IV

*Is there any other useful information about this material?*

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## 11. TOXICOLOGICAL INFORMATION

**TOXICITY DATA:** This product has been tested for oral toxicity. The following data are available:

LD<sub>50</sub> (Oral-Rat) 940 mg/kg

**SUSPECTED CANCER AGENT:** The components of this product are not found on the following lists: U.S. FEDERAL OSHA Z LIST, NTP, IARC, and CAL/OSHA and therefore are not considered to be, nor suspected to be, cancer causing agents by these agencies.

**IRRITANCY OF PRODUCT:** This product is moderately irritating to contaminated tissue.

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## 11. TOXICOLOGICAL INFORMATION (Continued)

SENSITIZATION OF PRODUCT: This product contains no known human skin or respiratory sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: This product is not reported to produce mutagenic effects in humans.

Embryotoxicity: This product is not reported to produce embryotoxic effects in humans.

Teratogenicity: This product is not reported to cause teratogenic effects in humans.

Reproductive Toxicity: This product is not reported to cause reproductive toxicity effects in humans

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

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

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## 12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of this product are relatively stable under ambient, environmental conditions.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This product may be harmful to terrestrial plant or animal life, especially if released in large quantities.

EFFECT OF CHEMICAL ON AQUATIC LIFE: This product may be harmful to aquatic plant or animal life, especially if released in large quantities.

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## 13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations, or appropriate Canadian standards. 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.

EPA WASTE NUMBER: Not applicable to wastes consisting only of this product.

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## 14. TRANSPORTATION INFORMATION

THIS MATERIAL IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Not Applicable

HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable

UN IDENTIFICATION NUMBER: Not Applicable

PACKING GROUP: Not Applicable

DOT LABEL(S) REQUIRED: Not Applicable

NORTH AMERICAN EMERGENCY RESPONSE GUIDE NUMBER (2000): Not Applicable

MARINE POLLUTANT: This product does not contain any components which are designated by the Department of Transportation to be Marine Pollutants (per 49 CFR 172.101 Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This material is not considered as dangerous goods, per regulations of Transport Canada.

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## 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, and are listed as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
CALCIUM NITRATE (as Nitrite Compounds, Water Dissociable)	NO	NO	YES

## 15. REGULATORY INFORMATION (Continued)

### ADDITIONAL UNITED STATES REGULATIONS (continued):

U.S. SARA THRESHOLD PLANNING QUANTITY There are no specific Threshold Planning Quantities for the components of this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

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

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

U.S. TSCA INVENTORY STATUS: The components of this product are on the U.S. TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

U.S. STATE REGULATORY INFORMATION: The components of this product are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: No.

California - Permissible Exposure Limits for Chemical Contaminants: No.

Florida - Substance List: No.

Illinois - Toxic Substance List: No.

Kansas - Section 302/313 List: No.

Massachusetts - Substance List: No.

Michigan - Critical Materials Register: No.

Minnesota - List of Hazardous Substances: No.

Missouri - Employer Information/Toxic Substance List: No.

New Jersey - Right to Know Hazardous Substance List: Calcium Nitrite.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.

Pennsylvania - Hazardous Substance List: No.

Rhode Island - Hazardous Substance List: No.

Texas - Hazardous Substance List: No.

West Virginia - Hazardous Substance List: No.

Wisconsin - Toxic and Hazardous Substances: No.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this product is on the California Proposition 65 lists.

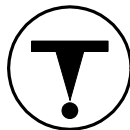
ANSI LABELING (per Z129.1, provided to summarize occupational safety hazards): **WARNING!** CAUSES SKIN OR EYE IRRITATION. MAY BE HARMFUL OR FATAL IF SWALLOWED. Keep away from flammable or combustible materials. Do not taste or swallow. Do not get on skin, in eyes, or on clothing. Avoid breathing vapors or mists. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, face-shield, and suitable body protection. **FIRST-AID:** In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention. **IN CASE OF FIRE:** Use water fog, dry chemical, CO<sub>2</sub>, or "alcohol" foam. **IN CASE OF SPILL:** Absorb spill with inert material. Place residue in suitable container. Consult Material Safety Data Sheet for additional information.

CURRENT LABELING (Precautionary Statements): **WARNING!** **INGESTION:** Temporary intestinal upset. **SKIN CONTACT:** Mild irritant. **SKIN ABSORPTION:** Mild irritant. **EYE CONTACT:** Mild irritant. **FIRST-AID:** **INGESTION:** Flush system with water. Take milk of magnesia. **SKIN:** Wash with plenty of soap and water. **EYE:** Flush with running water for a minimum of 15 minutes. **Inhalation:** Get patient to fresh air; blow nose to remove dust. **IN CASE OF FIRE:** Aqueous solution is non-flammable, but dry solids will support combustion of flammable materials. Organic nitrites and nitrates are powerful oxidizing agents. Exposure to heat or flame can emit toxic oxides of nitrogen. **IN CASE OF SPILL:** Clean-up at once. Do not allow dried-out spill to remain near flammable material. See MSDS for further information.

### ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL INVENTORY: The components of this product are on the DSL Inventory.

CANADIAN WHMIS SYMBOLS: **Class D2B:** Materials Causing Other Toxic Effects



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## 16. OTHER INFORMATION

### PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.  
9163 Chesapeake Drive, San Diego, CA 92123-1002  
(8589) 565 - 0302  
January 30, 2003

### DATE OF PRINTING:

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## DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

**CAS #:** This is the Chemical Abstract Service Number which uniquely identifies each constituent.

### EXPOSURE LIMITS IN AIR:

**ACGIH** - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level (**C**). Skin absorption effects must also be considered.

**OSHA** - U.S. Occupational Safety and Health Administration.

**PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.

**IDLH** - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called **Recommended Exposure Levels (RELs)**. When no exposure guidelines are established, an entry of **NE** is made for reference.

### HAZARD RATINGS:

**HAZARDOUS MATERIALS IDENTIFICATION SYSTEM:** Health

Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

**NATIONAL FIRE PROTECTION ASSOCIATION:** Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury).

### NATIONAL FIRE PROTECTION ASSOCIATION (Continued):

Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

### FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

### TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD<sub>50</sub>** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC<sub>50</sub>** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m<sup>3</sup>** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

### REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (**SARA**); the Canadian Domestic/Non-Domestic Substances List (**DSL/NDSL**); the U.S. Toxic Substance Control Act (**TSCA**); Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA** or **Superfund**); and various state regulations.