



SAFETY DATA SHEET

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

1. PRODUCT IDENTIFICATION

PRODUCT NAME: DOUBLE STAIN

PRODUCT NUMBER: 6379

SYNONYMS: Not Applicable-Mixture

CHEMICAL FAMILY NAME: Mixture of Lactic Acid, Acetic Acid and Phenol Solution

FORMULA: Mixture

PRODUCT USE:

Biological Specimen Mounting and Preserving

U.S. MANUFACTURER/DISTRIBUTOR:

BIOQUIP PRODUCTS, INC.

ADDRESS:

2321 Gladwick Street
Rancho Dominguez, CA 92020

BUSINESS PHONE:

1-310-667-8800

WEBSITE:

www.bioquip.com

EMERGENCY PHONE:

For Chemical or Medical Emergency, 24hr, 7 days, 365
INFOTRAC (24hr) 1-800-535-5053

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 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.

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Product Description: Clear, deep, bright, pink, corrosive, toxic, combustible liquid with a sweet or tar-like, acidic odor. Long-standing product may have a pinkish or brownish coloration. **Health Hazards:** This product is toxin by inhalation. This product may cause severe irritation or burns by all routes of exposure, especially if contact is prolonged. Burns may not be immediately visible or painful. Direct eye contact may cause tissue damage or blindness. Ingestion of this product may be harmful or fatal. The Phenol component of this product can cause significant toxic effects by skin absorption. Repeated inhalation of low concentrations may cause reduced lung capacity. Repeated low level skin contact may cause dermatitis. **Flammability Hazards:** This product is a combustible liquid which must be highly heated to ignite. If involved in a fire, this product will ignite to produce toxic gases (i.e. carbon monoxide, carbon dioxide, nitrogen oxides, aldehydes, ketones and acids). **Reactivity Hazards:** This product is not reactive. **Environmental Hazards:** This product may cause harm to the environment if accidentally released to an aquatic environment. **Emergency Response Procedures:** Emergency responders must wear the proper personal protective equipment (and have appropriate fire-suppression equipment) suitable for the situation to which they are responding.

3. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% w/v
Acid Fuchsin Calcium Salt	123334-10-1	4.3-5.0%
Phenol	108-95-2	5.44%
Proprietary Lignin Pink Dye		8.7%
Glacial Acetic Acid	64-19-7	12.9%
Lactic Acid	50-21-5	64.4%
Water	7732-18-5	Balance

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT, OR BY THEMSELVES. If necessary, Self-Contained Breathing Apparatus and fire-retardant clothing should be worn. Victims of chemical exposure must be taken for medical attention. Remove or cover gross contamination to avoid exposure to rescuers. Rescuers should be taken for medical attention if necessary. Take a copy of label and MSDS to health professional with victim.

INHALATION: If vapors, mists, or sprays of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if adverse effect occurs after removal to fresh air.

SKIN EXPOSURE: If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Do not interrupt flushing. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek medical attention if adverse effect continues after flushing.

4. FIRST-AID MEASURES (Continued)

EYE EXPOSURE: If this product's 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 15 minutes. Do not interrupt flushing. Victim must seek medical attention if adverse effect continues after flushing.

INGESTION EXPOSURE: 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. Rinse mouth with water immediately. Victim should drink large quantities of water. If milk is available, victim should drink it after drinking water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow. Seek immediate medical attention.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing dermatitis, other skin conditions, and respiratory problems may be aggravated by over-exposure to this product.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

5. FIRE-FIGHTING MEASURES

FLASH POINT (est.): > 80.44°C (> 176.8°F)

AUTOIGNITION TEMPERATURE: Not applicable.

Acetic Acid: 463°C (867°F) Phenol: 715°C (1319°F)

FLAMMABLE LIMITS (in air by volume, %): Not available for product. The following values are available for flammable components of this product.

	Lower (LEL):	Upper (UEL):
Acetic Acid:	4.0%	19.9%
Phenol:	1.3%	8.6%

FIRE EXTINGUISHING MATERIALS:

Water Spray: YES Carbon Dioxide: Yes Foam: YES
Dry Chemical: YES Halon: NO Other: Any "ABC" Class.

FIRE EXTINGUISHING MATERIALS NOT TO BE USED: Halon extinguishing materials should be avoided due to Phenol in this product.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is corrosive and toxic and presents a contact hazard to firefighters. This product is combustible; it must be highly heated in order to ignite. Vapors can accumulate in confined spaces, resulting in a toxicity hazard and may present a hazard of combustibility. Closed containers may rupture violently when heated. When involved in a fire, this material may decompose and produce acidic vapors and toxic gases (including carbon monoxide, carbon dioxide, nitrogen oxides, aldehydes, ketones and acids).

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Probably not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: In the event of fire, cool containers of this product with water to prevent failure. Use a water spray or fog to reduce or direct vapors. Move containers from fire area if it can be done without risk to firefighters. If this is not possible, cool fire exposed containers from the sides with water until well after the fire is out. Fires involving products containing Phenol should be fought upwind from the maximum distance possible. Keep unnecessary people away; isolate the hazard area and deny entry. Emergency personnel should stay out of low areas and ventilate closed spaces before entering. Dike fire control water for later disposal; do not scatter this material. Stay away from the ends of containers. Incipient fire responders should wear eye protection. Structural fire fighters 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. If necessary, decontaminate fire-response equipment with soap and water solution. Rinse contaminated equipment thoroughly with sodium bicarbonate solution (or another neutralizer for acids) before returning such equipment to service.

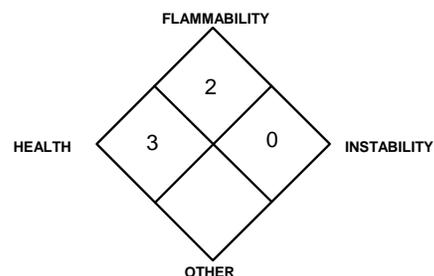
6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Trained personnel using pre-planned procedures should respond to uncontrolled releases. Proper protective equipment should be used. In case of a spill, clear the affected area and protect people. Eliminate all sources of ignition before cleanup begins. Use non-sparking tools. Combustible vapor levels must be below 10% of the LEL for components (see Section 5, Fire-Fighting Measures) before personnel are permitted to enter the area. The atmosphere must have levels of components lower than those listed in Section 8, (Exposure Controls and Personal Protective Equipment), if applicable, and have at least 19.5 percent oxygen before non-response personnel can be allowed into the area without Self-Contained Breathing Apparatus (SCBA).

Small Spills: Wear proper personal protective equipment, including gloves, goggles, and appropriate clothing. Decontaminate the area thoroughly. Absorb spilled liquid with polypads, or other suitable inert absorbent materials, wearing gloves, goggles and apron. Avoid contact with spill and water. Neutralize residue with sodium bicarbonate or other neutralizing agent for acids. Place spilled material in appropriate container for disposal, sealing tightly. Remove all residue before decontamination of spill area. Decontaminate the area thoroughly. Test area with litmus paper to ensure neutralization.

Large Spills: Minimum Personal Protective Equipment should be **Level B: triple-gloves (rubber gloves and nitrile gloves over latex gloves), Tyvek or other protective clothing and boots, hard hat, and Self-Contained Breathing Apparatus.** For large spills, dike or otherwise contain spill and remove with vacuum truck or pump to storage/salvage vessels. Decontaminate the area thoroughly. Prevent material from entering sewer or confined spaces, waterways, soil or public waters.

NFPA RATING



Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate
3 = Serious 4 = Severe

6. ACCIDENTAL RELEASE MEASURES (Continued)

SPILL AND LEAK RESPONSE (continued):

Large Spills (continued): Monitor area for combustible vapor levels and confirm levels are below exposure limits given in Section 8 (Exposure Controls-Personal Protection), if applicable, and that levels are below applicable LELs (see Section 5 – Fire Fighting Measures) before non-response personnel are allowed into the spill area. Neutralize residue with sodium bicarbonate or other neutralizing agent for acids. Decontaminate the area thoroughly. Test area with litmus paper to ensure neutralization.

Place all spill residue in a double plastic bag, 55-gallon drum or other containment and seal. 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.

THIS IS A CORROSIVE, COMBUSTIBLE, TOXIC LIQUID: Protection of all personnel and the area must be maintained. All responders must be adequately protected from exposure.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: All employees who handle this material should be trained to handle it safely. This material must be used by, or directly under the supervision of, a technically qualified individual. Minimize all exposures 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. For example, laboratory work with this product should be conducted in a hood with the sash pulled down.

STORAGE AND HANDLING PRACTICES: Use in a well-ventilated location, segregated from other materials and operations. Keep away from water, heat, sparks, and other sources of ignition. Use non-sparking tools. Transfers of this product must be free of moisture or water. Bond and ground containers during transfers of material. Containers of this product must be properly labeled. If this product is transferred into another container, only use portable containers and dispensing equipment (faucet, pump, drip can) approved for corrosive, acidic liquids. Keep container tightly closed when not in use. Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Containers should be separated from oxidizing materials by a minimum distance of 20 ft. or by a barrier of non-combustible material at least 5 ft. high having a fire-resistance rating of at least 0.5 hours. Storage areas should be made of fire resistant materials. 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). Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged. Refer to NFPA 30, *Flammable and Combustible Liquids Code*, for additional information on storage. Empty containers may contain residual liquid or vapors which are corrosive; therefore, empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

SPECIFIC USE(S): This product is used in insect mounting. 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 U.S. Federal, State, or local procedures, or applicable standards of Canada and its Provinces.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: 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 a non-sparking, grounded, explosion-proof ventilation system separate from other exhaust ventilation systems. Exhaust directly to the outside, taking necessary precautions for environmental protection. An eyewash and safety shower should be readily accessible.

EXPOSURE LIMITS:

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		
Acetic Acid	64-19-7	10	15	10	NE	10	15	50	NE
Lactic Acid	50-21-5	NE	NE	NE	NE	NE	NE	NE	NE
Phenol	108-95-2	5 (skin)	NE	5 (skin)	NE	5 (skin)	15.6 (ceiling) skin	250	DFG MAK: Skin Carcinogenicity: EPA-D, EPA-I, IARC-3, MAK-3B, TLV-A4
Acid Fuchsin Calcium Salt	12333-10-1	NE	NE	NE	NE	NE	NE	NE	NE
Proprietary Lignin Pink Dye		NE	NE	NE	NE	NE	NE	NE	NE

NE = Not Established.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

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), equivalent standards of Canada. Please, reference applicable regulations and current standards for relevant details.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below exposure limits listed in this section, if applicable. Use a NIOSH air purifying respirator with an organic vapor/high-efficiency particulate (HEPA) filter cartridges when exposure is likely. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) and equivalent U.S. State standards, or the 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). The following are NIOSH respiratory equipment guidelines for the Acetic Acid and Phenol components.

ACETIC ACID

CONCENTRATION

Up to 50 ppm:

RESPIRATORY PROTECTION

Any Supplied-Air Respirator operated in a continuous-flow mode (SAR), or any Powered, Air-Purifying Respirator with organic vapor cartridge(s), or any Chemical Cartridge Respirator with a full facepiece and organic vapor cartridge(s), or any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister, or any Self-Contained Breathing Apparatus with a full facepiece, or any Supplied-Air Respirator with a full facepiece.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.

Escape: Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister, or any appropriate escape-type, SCBA.

PHENOL

CONCENTRATION

Up to 50 ppm:

RESPIRATORY PROTECTION

Any Chemical Cartridge Respirator with organic vapor cartridge(s) in combination with a dust and mist filter, or any Supplied-Air Respirator (SAR).

Up to 125 ppm: Any SAR operated in a continuous-flow mode, or any Powered, Air-Purifying Respirator (PAPR) with organic vapor cartridge(s) in combination with a dust and mist filter.

Up to 250 ppm: Any Chemical Cartridge Respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter, or any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter, or any PAPR with a tight-fitting facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter, or any Self-Contained Breathing Apparatus with a full facepiece, or any SAR with a full facepiece.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.

Escape: Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter, or any appropriate escape-type, SCBA.

EYE PROTECTION: Splash goggles or safety glasses with sideshields. Wear a face shield when handling more than 1 liter. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or the Canadian CSA Standard Z94.3-M1982, *Industrial Eye and Face Protectors*.

HAND PROTECTION: Wear butyl rubber, Teflon™, Barricade™, Chemrel™, or similar gloves for routine industrial use. Due to the significant toxicity hazard posed by the Phenol component in this product, very thin natural rubber, neoprene, nitrile and PVC gloves (0.3 mm or less) are not recommended. Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: When chemical contact is possible, use splash apron, work uniform, and shoes or coverlets to prevent skin contact. Full-body chemical protective clothing is recommended for emergency response procedures. If necessary, refer to the OSHA Technical Manual (Section VII: Personal Protective Equipment) or appropriate Standards of Canada. 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 29 CFR 1910.136 and the Canadian CSA Standard Z195-M1984, *Protective Footwear*.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for the main component, Lactic Acid:

pH: > 1 (concentrated solution)

MELTING POINT: 16.8°C (62.2°F)

BOILING POINT: 125-140°C (257-284°F)

VAPOR PRESSURE @ 25°C: 0.011 kPa (0.0813 mmHg)

EVAPORATION RATE (nBuAc): Probably negligible.

SOLUBILITY IN WATER: Soluble in all proportions

LOG COEFFICIENT WATER/OIL DISTRIBUTION: Log P(oct) = -0.62-0.72

ODOR THRESHOLD: 9 mg/m³

VISCOSITY DYNAMIC (88.6% sol.): 36.9 mPas

SPECIFIC GRAVITY (water = 1) 88.6 sol.: 1.201

VAPOR DENSITY (air = 1): Not available.

EXPANSION RATIO: Not applicable.

SPECIFIC VOLUME: Not applicable.

9. PHYSICAL and CHEMICAL PROPERTIES (Continued)

The following information is for the product:

pH: 2

APPEARANCE, ODOR AND COLOR: Clear, deep, bright, pink, corrosive liquid with a sweet or tar-like, acidic odor. Long-standing product may have a pinkish or brownish coloration.

HOW TO DETECT THIS SUBSTANCE (warning properties): The odor of this product should not be used to identify an accidental release due to the high toxicity of the Phenol component. pH paper will turn red in contact with this product.

10. STABILITY and REACTIVITY

STABILITY: Due to the high level of Lactic Acid, this product may self-polymerize; however, the reaction is not hazardous as it does not form more hazardous materials or significant heat.

DECOMPOSITION PRODUCTS: *Thermal:* When exposed to high temperatures this product will ignite and produce carbon monoxide, carbon dioxide, nitrogen oxides, aldehydes, ketones and acids. Hydrolysis: None known.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product may be incompatible with strong oxidizing agents (i.e. peroxides, nitrates and perchlorates), nitric acid and hydrofluoric acid, reducing agents (e.g. hydrogen iodide, lithium aluminum hydride or sodium borohydride), alkali and metal hydroxides (e.g. aluminum hydroxide) or anhydrous metal chlorides (tin, iron, aluminum), strong acids (e.g. sulfuric, nitric or hydrochloric acids) or strong bases (e.g. sodium or potassium hydroxide or aliphatic amines), sodium nitrite or sodium nitrate, trifluoroacetic acid), formaldehyde, aluminum chloride and nitrobenzene. This product may attack some plastics, rubber and coatings.

HAZARDOUS POLYMERIZATION: Due to the high level of Lactic Acid, this product may self-polymerize; however, the reaction is not hazardous as it does not form more hazardous materials or significant heat.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to water, heat, sparks and other sources of ignition.

11. TOXICOLOGICAL INFORMATION

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE:

The most significant routes of occupational overexposure are by inhalation and skin and eye contact. The symptoms of over-exposure to this product are as follows:

INHALATION: This product is toxic by 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 exposures or exposures to high concentrations of this solution. Severe inhalation over-exposures can lead to chemical pneumonitis, pulmonary edema, and death. Chronic inhalation exposures may result in dental erosion and perforation of the nasal septum. Additional information on effects by inhalation can include those described under 'Skin Absorption' and 'Ingestion'.

CONTACT WITH SKIN or EYES: Direct contact of this product with the skin may cause severe irritation or burns, especially if contact is prolonged. Burns may not be immediately visible or painful. Due to the presence of Phenol, even minor contact can result in corrosive injury with burns, blisters, permanent skin damage and gangrene. Repeated or prolonged skin contact may lead to a characteristic darkening of skin and urine (ochronosis) from Phenol toxicity. Eye contact of concentrated vapors of this product will cause immediate irritation and pain. Contact with the liquid and the eyes can cause severe irritation or cause blindness.

SKIN ABSORPTION: The Phenol component of this product can be absorbed via intact skin and cause toxic effects by this route of exposure including difficult breathing, shock, muscle weakness, tremors, loss of coordination, shock, sudden collapse, coma, convulsions, organ damage and, if a large area of skin is involved and contact is prolonged, coma or death. Repeated contact with dilute solutions or even brief contact with concentrated solutions can pose a risk to life. Initially, Phenol can cause numbness or slight tingling, so that contact may be ignored. Signs and symptoms of Phenol toxicity develop rapidly.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	3*
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FLAMMABILITY HAZARD	(RED)	2
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PHYSICAL HAZARD	(YELLOW)	0
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PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
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SEE SECTION 8

For Routine Industrial Use and Handling Applications

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate
3 = Serious 4 = Severe * = Chronic hazard

11. TOXICOLOGICAL INFORMATION (Continued)

INGESTION: Ingestion is not anticipated to be a significant route of over-exposure for this product. This product is corrosive and can cause severe irritation, swelling, burns and damage to the mouth, throat and stomach if ingested. Internal bleeding, vomiting, diarrhea, decreased blood pressure, shock, collapse and coma may result. The Phenol component is very toxic and death may occur rapidly following ingestion of this product. The lowest estimated lethal dose is 140 mg/kg. In one case, death resulted from ingestion of as little as 15 mL. A significant hazard associated with ingestion of this product is via aspiration; aspiration of this material into the lungs can cause severe lung irritation and tissue damage, which can result in the development of chemical pneumonia or pulmonary edema (which are potentially fatal conditions)

INJECTION: Injection is not anticipated to be a significant route of over-exposure for this product. If this product is "injected" (as may occur through punctures by contaminated, sharp objects), local swelling and irritation can occur.

OTHER HEALTH EFFECTS: Severe poisoning has sometimes reported following long-term contact with products containing Phenol. Symptoms can include vomiting, difficulty swallowing, diarrhea, loss of appetite, headache, fainting, dizziness, mental disturbances and dark coloration of the urine. Skin discoloration and eruptions have also been observed. Phenol toxicity can be sometimes fatal and extensive damage to the liver and kidneys was observed. This condition is sometimes referred to as "marasmus". Some evidence exists that chronic exposure to Phenol and Phenol containing products may cause adverse effects on the blood.

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

ACUTE: Contact by all routes may cause severe irritation or burns. Direct eye contact may be severely irritating or cause tissue damage or blindness.

CHRONIC: Prolonged or repeated skin over-exposures can cause dermatitis. Chronic inhalation of low levels may cause damage to the respiratory system and reduced lung capacity.

TARGET ORGANS: ACUTE: Skin, eyes, central nervous system, respiratory system, eyes. CHRONIC: Skin, respiratory system, kidneys, and liver.

TOXICITY DATA: Currently, the following toxicological data are available for components. Due to the large volume of data available for components, only irritation data, human data, LD₅₀ (Oral-Rat), LD₅₀ (Oral-Mouse), LD₅₀ (Skin-Rabbit), LC₅₀ (Inhalation-Rat) and LC₅₀ (Inhalation-Mouse) data are presented in this MSDS. For information on other data available, please contact Bioquip.

ACETIC ACID:

Standard Draize Test (Skin-Human) 50 mg/24 hours: Mild

Standard Draize Test (Skin-Rabbit) 50 mg/24 hours: Mild

Open Irritation Test (Skin-Rabbit) 525 mg: Severe
Rinsed with Water (Eye-Rabbit) 5 mg/30 second: Mild

TCLo (Inhalation-Human) 10 ppm/2 hours: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified

TCLo (Inhalation-Human) 816 ppm/3 minutes: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Sense Organs and Special Senses (Eye): effect, not otherwise specified; Lungs, Thorax, or Respiration: other changes

TDLo (Oral-Human) 1470 µg/kg: Gastrointestinal: changes in structure or function of esophagus, ulceration or bleeding from small intestine, ulceration or bleeding from large intestine

TDLo (Rectal-Child) 281 µL/kg: Gastrointestinal: alteration in gastric secretion; Liver: liver function tests impaired; Kidney/Ureter/Bladder: changes in tubules (including acute renal failure, acute tubular necrosis)

ACETIC ACID (continued):

LDLo (Unreported-Man) 308 mg/kg

LC₅₀ (Inhalation-Mouse) 5620 ppm/1 hour: Sense Organs and Special Senses (Eye): conjunctive irritation, effect, not otherwise specified; Blood: other changes

LD₅₀ (Oral-Rat) 3310 mg/kg

LD₅₀ (Skin-Rabbit) 1060 µL/kg

LACTIC ACID:

Standard Draize Test (Skin-Human) 10%/48 hours

Standard Draize Test (Skin-Rabbit) 5 mg/24 hours: Severe

Standard Draize Test (Skin-Rabbit) 100 mg/24 hours: Moderate

Standard Draize Test (Eye-Rabbit) 750 µg: Severe

LD₅₀ (Oral-Rat) 3543 mg/kg

LD₅₀ (Oral-Mouse) 4875 mg/kg

LD₅₀ (Skin-Rabbit) > 2 gm/kg

PHENOL:

Standard Draize Test (Skin-Rabbit) 500 mg/24 hours: Severe

Standard Draize Test (Skin-Rabbit) 100 mg: Mild

Open Irritation Test (Skin-Rabbit) 535 mg: Severe

Standard Draize Test (Eye-Rabbit) 5 mg: Severe

PHENOL (continued):

Rinsed with Water (Eye-Rabbit) 5 mg/30 seconds: Mild

LDLo (Oral-Infant) 10 mg/kg: Behavioral: muscle weakness; Lungs, Thorax, or Respiration: cyanosis

LDLo (Oral-Human) 14 gm/kg: Behavioral: muscle weakness; Lungs, Thorax, or Respiration: cyanosis

LDLo (Oral-Human) 140 mg/kg: Behavioral: hallucinations, distorted perceptions; Skin and Appendages: sweating

LD₅₀ (Oral-Rat) 317 mg/kg: Behavioral: convulsions or effect on seizure threshold

LD₅₀ (Oral-Mouse) 270 mg/kg

LD₅₀ (Skin-Rat) 669 mg/kg: Behavioral: tremor; Kidney, Ureter, Bladder: hematuria; Skin and Appendages: cutaneous sensitization, experimental (after topical exposure)

LD₅₀ (Skin-Rabbit) 630 mg/kg

LC₅₀ (Inhalation-Rat) 316 mg/m³

LC₅₀ (Inhalation-Mouse) 177 mg/m³

CARCINOGENIC POTENTIAL: The components are listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

PHENOL: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen); EPA-D (Not Classifiable as to Human Carcinogenicity); EPA-I (Data are Inadequate for An Assessment of Human Carcinogenic Potential); MAK-3B (Substances for Which in vitro tests or Animal Studies Have Yielded Evidence of Carcinogenic Effects that is Not Sufficient for Classification of the Substance in One of the Other Categories)

The remaining components are not found on the following lists: U.S. EPA, U.S. NTP, U.S. OSHA, U.S. NIOSH, GERMAN MAK, IARC, or ACGIH, and is therefore not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: The liquid or vapors of this product are corrosive to all contaminated tissue.

SENSITIZATION TO THE PRODUCT: The components of this product are not known to be human skin or respiratory sensitizers.

TOXICOLOGICALLY SYNERGISTIC MATERIALS: The Phenol component can promote the development of skin cancer when applied with known carcinogens.

11. TOXICOLOGICAL INFORMATION (Continued)

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

Mutagenicity: The components of this product are not reported to cause mutagenic effects in humans. Positive and negative results have been obtained in tests involving the Phenol component using cultured animal cells and bacteria.

Embryotoxicity: The components of this product are not reported to cause embryotoxic effects in humans. Animal studies suggest that the Phenol component will not cause significant developmental effects in the absence of maternal toxicity.

Teratogenicity: The components of this product are not reported to cause teratogenic effects in humans.

Reproductive Toxicity: The components of this product are not reported to cause reproductive effects in humans.

*A **mutagen** is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation 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.*

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, there are Biological Exposure Indices (BEIs) determined for the components of this product, as follows:

CHEMICAL: DETERMINANT	SAMPLING TIME	BEI
Phenol • Total Phenol in urine	• End of shift	• 250 mg/g creatinine

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

MOBILITY: The following data are currently available for the components.

ACETIC ACID:

Soil Adsorption/Mobility: Adsorption of Acetic Acid to 3 nearshore marine sediments collected from three different locations (clastic mud, 3.5% organic carbon, pH=7.0; lateritic muddy sand, 1.3% organic carbon, pH=7.7; and fine carbonate sand; 0.17% organic carbon, pH=8.1) ranged from 9 to 23% of Acetic Acid; Kd values of 0.65 (Koc=228), 0.085 (Koc=6.5), and 0.046 (Koc=27) were measured for the clastic mud, muddy sand, and carbonate sand, respectively. A log Koc of 0.00 (Koc=1), which was derived from experimental measurements, was reported for Acetic Acid. According to a classification scheme, Koc values ranging from 1 to 228 suggest that Acetic Acid is expected to have very high to moderate mobility in soil. No detectable sorption was measured for Acetic Acid using the OECD Guideline 106 method; three different soils were used, an acidic forest soil, pH=2.8, an agricultural soil, pH=6.7, and a lake sediment, pH=7.1.

LACTIC ACID:

Soil Adsorption/Mobility: Based on a classification scheme, an estimated Koc value of 9.7, determined from a log Kow of -0.72 and a regression-derived equation, and experimental values of 5.7 and < 0.08 in mud and muddy sand, indicate that Lactic Acid is expected to have very high mobility in soil. The pKa of Lactic Acid is 3.86, indicating that this compound will primarily exist as an anion in the environment and anions generally have greater mobility in soils containing organic carbon and clay than their neutral counterparts. Based on a classification scheme, experimental Koc values of 5.7 and <0.08 on a clastic mud (3.5% organic carbon) and a lateritic muddy sand (1.3% organic carbon), respectively, indicate that Lactic Acid is not expected to adsorb to suspended solids and sediment.

PHENOL:

Soil Adsorption/Mobility: Phenol is reported to have low adsorptivity to clay soils and silt loam and no adsorption to aquifer material and montmorillonite and kaolinite clays. The Koc for Phenol to a Batcombe silt loam soil (pH 6.7, organic carbon 2.51%) was 30. It was 16 for a Brookstone clay loam (pH 5.7, organic matter 5.1%) and varied with pH and iron content of the soil. The Freundlich K and (1/N) for Phenol in Captina (pH 5.7, 1.1 % organic matter) and Palouse silt loam (pH 5.7, 3.6% organic matter) soils were 0.58 (1.15) and 0.81 (1.00); the Koc values for these soils are 91 and 39. Based on the reported Koc values, Phenol would be expected to generally exhibit very high mobility in soil, based on a classification scheme. In a study of the adsorption of Phenol onto siltstone associated with a Wyoming coal deposit suitable for in situ gasification, the pH of the solution was the major controlling factor with adsorption occurring at pH's below the pKa of Phenol and no adsorption occurring at pH's above the pKa. The log of the Freundlich K value was approximately -4. Therefore, Phenol may be transported by groundwater near in situ coal gasification sites due to the elevated pH's at these sites after gasification. The pKa of Phenol is 9.99, indicating that it will be partially dissociated at the upper end of environmental pH range and its mobility may be pH dependent. In general, anions generally do not adsorb to organic carbon and clay as strongly as their neutral counterparts.

PERSISTENCE AND BIODEGRADABILITY: The following data are currently available for the components.

ACETIC ACID:

Persistence and Biodegradability: Formation of Acetic Acid can occur via the reaction of olefins with ozone in the atmosphere. Decomposition of solid biological wastes produces Acetic Acid which is readily metabolized by living organisms; Acetic Acid occurs as a normal metabolite in both plants and animals. If released to air, a vapor pressure of 15.7 mm Hg at 25°C indicates Acetic Acid will exist solely as a vapor in the ambient atmosphere. Vapor-phase Acetic Acid will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 22 days. Acetic acid does not absorb light with wavelengths > 290 nm, and is not expected to be susceptible to direct photolysis by sunlight. If released to soil, Acetic Acid is expected to have very high to moderate mobility based upon Koc values ranging from 6.5 to 228. Volatilization from moist soil surfaces is not expected to be an important fate process, since the pKa of Acetic Acid is 4.74, indicating that it will primarily exist in the dissociated form in the environment. Acetic acid may volatilize from dry soil surfaces based upon its vapor pressure. The major environmental fate process for Acetic Acid is biodegradation. A large number of biological screening studies have determined that Acetic Acid biodegrades readily under both aerobic and anaerobic conditions. If released into water, Acetic Acid is not expected to adsorb to suspended solids and sediment based upon the Koc values. Acetic acid is expected to exist in the dissociated form in the environment and therefore volatilization from water surfaces is not expected to be an important fate process. Hydrolysis is not expected to be an important environmental fate process since this compound lacks functional groups that hydrolyze under environmental conditions.

LACTIC ACID:

Persistence and Biodegradability: Volatilization of Lactic Acid from moist soil surfaces is not expected to be an important fate process because anions do not volatilize. Lactic Acid is not expected to volatilize from dry soil surfaces based upon a vapor pressure of 0.0813 mmHg. Lactic Acid may be susceptible to biodegradation in terrestrial environments based on the observed degradation of 33.3% after 24 hours, 12-59% after 5 days, and 88% after 30 days when incubated with activated sludge. The pKa of Lactic Acid is 3.86, indicating that this compound will primarily exist in the anion form in the environment and anions generally do not adsorb more strongly to sediment and suspended solids containing organic carbon and clay than their neutral counterparts. Volatilization from water surfaces is not expected because anions do not volatilize. Lactic Acid may be susceptible to biodegradation in aquatic environments based on the observed degradation of 33.3% after 24 hours, 12-59% after 5 days, and 88% after 30 days when incubated with activated sludge. Lactic Acid was also found to be amenable to anaerobic degradation in salt marsh sediment and wastewater. According to a model of gas/particle partitioning of semi-volatile organic compounds in the atmosphere, Lactic Acid, which has a vapor pressure of 0.0813 mmHg at 25°C, is expected to exist solely as a vapor in the ambient atmosphere. Vapor-phase Lactic Acid is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 65 hours, calculated from its rate constant of 5.9X10⁻¹² cu cm/molecule-sec at 25°C that was derived using a structure estimation method. Lactic Acid does not contain chromophores that absorb at wavelengths > 290 nm and therefore is not expected to be susceptible to direct photolysis by sunlight. Lactic Acid reached 22% of its theoretical BOD in 5 days using a sewage inoculum. In a closed bottle screening test, Lactic Acid, present at 2 mg/L, reached 12, 67, and 88% of its theoretical BOD after 5, 15, and 30 days, respectively, using an activated sludge inoculum. Lactic Acid reached 59% of its theoretical BOD in 5 days using a sludge inoculum and the Warburg screening test. Lactic Acid, present at 500 mg/L, reached 27.5, 29.4, and 33.3% of its theoretical BOD in 6, 12, and 24 hours, respectively, using an activated sludge inoculum at 2500 mg/L. Lactic Acid was found to be easily biodegradable by biological sewage treatment.

12. ECOLOGICAL INFORMATION (Continued)

PERSISTENCE AND BIODEGRADABILITY (continued):

PHENOL:

Persistence and Biodegradability: If released to air, a measured vapor pressure of 0.35 mm Hg at 25°C indicates Phenol will exist solely as a vapor in the ambient atmosphere. The measured rate constant for the vapor-phase reaction of Phenol with photochemically produced hydroxyl radicals is 2.63×10^{-11} cu cm/molecule sec at 25°C. This corresponds to an atmospheric half-life of 14.6 hours at an atmospheric concentration of 5×10^5 hydroxyl radicals per cu cm. During the nighttime, Phenol reacts with nitrate radicals with a resulting half-life of 12 minutes. If released to soil, Phenol is expected to have high mobility based upon Koc values that are generally below 100. Volatilization from moist soil surfaces is not expected to be an important fate process based upon a Henry's Law constant of 3.33×10^{-7} atm-cu m/mole. The pKa of Phenol is 9.99, indicating that this compound will primarily exist in its un-ionized form at environmental conditions. Phenol is not expected to volatilize from dry soil surfaces based upon its vapor pressure 0.35 mm Hg at 25°C. Phenol's degradation in soil is completed in 2-5 days, even in subsurface soils. If released into water, Phenol is expected to adsorb to suspended solids and sediment based upon the Koc values of 2900 and 3100 for fine and coarse sediment, respectively. Phenol completely mineralized in <1 day in water from 3 lakes; rates increase with increasing concentrations of Phenol and the organic content of the water. It was completely removed in river water after 2 days at 20 deg C and after 4 days at 4°C. Volatilization from water surfaces is not expected to be an important fate process based upon Phenol's Henry's Law constant. Hydrolysis is not expected to be an important environmental fate process, since Phenol lacks functional groups that hydrolyze under environmental conditions.

BIO-ACCUMULATION POTENTIAL: The following data are currently available for the components.

ACETIC ACID:

Bioconcentration: An estimated BCF of 3.2 was calculated for Acetic Acid, using a log Kow of -0.71 and a regression-derived equation. According to a classification scheme, this BCF suggests the potential for bioconcentration in aquatic organisms is low.

LACTIC ACID:

Bioconcentration: An estimated BCF of 3.2 was calculated for Lactic Acid, using a log Kow of -0.72 and a regression-derived equation. According to a classification scheme, this BCF suggests the potential for bioconcentration in aquatic organisms is low.

PHENOL:

Bioconcentration: The BCFs reported in fish include: Goldorfe, 20; goldfish, (*Carassius auratus*), 1.9; fish (unspecified), 17; fish (unspecified), 1.7; and 39, rainbow trout (*Salmo gairdneri*). Phenol was rapidly eliminated from goldfish and therefore would be unlikely to bioaccumulate. According to a classification scheme, reported BCF values and the rapid elimination of Phenol suggests that bioaccumulation of Phenol is unlikely.

AQUATIC TOXICITY: This product may be harmful or fatal to contaminated aquatic plant and animal life. The following aquatic toxicity data are currently available for components.

ACETIC ACID:

LC₅₀ (Fathead minnows) 1 hour = > 315 mg/L (static bioassay in Lake Superior water at 18-22°C)

LC₅₀ (Fathead minnows) 24 hours = 122 mg/L (static bioassay in Lake Superior water at 18-22°C)

LC₅₀ (Fathead minnows) 48 hours = 92 mg/L (static bioassay in Lake Superior water at 18-22°C)

LC₅₀ (Fathead minnows) 88 hours = 88 mg/L (static bioassay in Lake Superior water at 18-22°C)

LC₅₀ (Fathead minnows) 88 hours = 88 mg/L (static bioassay in Lake Superior water at 18-22°C)

LC₅₀ (Fathead minnows) 1 hour = 175 mg/L static bioassay in reconstituted water at 18-22°C, pH<= 5.9

LC₅₀ (Fathead minnows) 24 hours = 106 mg/L static bioassay in reconstituted water at 18-22°C, pH<= 5.9

LC₅₀ (Fathead minnows) 48 hours = 106 mg/L static bioassay in reconstituted water at 18-22°C, pH<= 5.9

LC₅₀ (Fathead minnows) 72 hours = 79 mg/L static bioassay in reconstituted water at 18-22°C, pH<= 5.9

LC₅₀ (Fathead minnows) 96 hours = 79 mg/L (static bioassay in reconstituted water at 18-22°C, pH<= 5.9)

LC₅₀ (Shrimp) 48 hours = 100-300 mg/L aerated water

LC₅₀ (*Lepomis macrochirus* Bluegill sunfish) 96 hours = 75 mg/L / (static bioassay)

LC₅₀ (*Gambusia affinis* Mosquito fish) 96 hours = 251 mg/L (static bioassay maintained at pH 6.9 - 8.7 and 16 - 25°C)

EC₅₀ (Corn fumigation) 2 hours = 50 mg/cu m, effect: visible leaf injury (95% confidence interval: 35-65)

EC₅₀ (Soybean fumigation) 2 hours = 20 mg/cu m, effect: leaf injury (95% confidence interval 12-28)

EC₅₀ (Tobacco fumigation) 2 hours = 41 mg/cu m, effect: leaf injury (95% confidence interval 4-79)

EC₅₀ (Alfalfa fumigation) 2 hours = 8 mg/cu m, effect: leaf injury (95% confidence interval 6-10)

EC₅₀ (Wheat fumigation) 2 hours = 23 mg/cu m, effect: leaf injury (95% confidence interval 5-48)

EC₅₀ (*Daphnia magna*) 24 hours = 6,000 mg/L endpoint: immobilization (static bioassay, neutralized to pH 8.0 and 20°C)

LACTIC ACID:

LC₅₀ (*Oncorhynchus* sp Trout) 18 hours = 100 mg/L/Conditions of bioassay not specified in source examined

PHENOL:

Toxic (*Chlorella pyrenoidosa* algae) = 233; 1,060 mg/L
IC₁₀ (*Scenedesmus subspicatus* green algae) inhibition of fluorescence = 7.8 mg/L

IC₁₀ (*Scenedesmus subspicatus* green algae) growth inhibition = 28 mg/L

LC₀ (*Scenedesmus* algae) = 40 mg/L

EC₀ (*Pseudomonas putida* bacteria) 16 hours = 64 mg/L

EC₀ (*Microcystis aeruginosa* algae) 8 days = 4.6 mg/L

EC₀ (*Scenedesmus quadricauda* algae) 7 days = 7.5 mg/L

EC₃₇ (*Chlorella* sp. algae) 10 days = 300 ppm

EC₄₁ (*Protococcus* sp algae) 10 days = 300 ppm

EC₄₉ (*Dunaliella euclora* algae) 10 days = 100 ppm

EC₅₀ (*Gobius minutus*) 1 to 3 minutes = > 18,000 ppm (in seawater at 15°C after recovery period in unpolluted seawater)

EC₅₀ (*Gobius minutus*) 1 to 3 hours => 1,000 ppm (in seawater at 15°C after recovery period in unpolluted seawater)

EC₅₀ (*Gobius minutus*) 1 to 3 hours => 500 ppm (in seawater at 15°C after recovery period in unpolluted seawater)

EC₅₀ (Photobacterium) 5 minutes = 18 mg/L

EC₁₀₀ (*Phaeodactylum tricornutum* algae) 10 days = 100 ppm

EC₁₀₀ (Monochrysis lutheri algae) 10 days = 100 ppm

EC₀ (Uronema parduzi Chatton-Lwoff protozoan) 144 mg/L

Perturbation Level (*Paramecium caudatum* protozoan) = 10 mg/L

Perturbation Level (*Vorticella campanula* protozoan) = 3 mg/L

LC (rainbow trout) 3 hours = 5 mg/L

LC (perch) 1 hour = 9 mg/L

LC₀ (*Daphnia* crustacean) 16 mg/L

LC₀ (creek chub) = 10 mg/L

LC₅₀ (*Daphnia magna* crustacean) 24-48 hours = 100 mg/L

LC₅₀ (*Daphnia magna*, young crustacean) 24-48 hours = 7; 17 mg/L

LC₅₀ (*Daphnia magna*, adult crustacean) 24-48 hours = 21; 61 mg/L

LC₅₀ (brine shrimp) 24 hours = 56; 157 mg/L

LC₅₀ (*Lepomis macrochirus*) 24-48 hours = > 10; >15 mg/L

LC₅₀ (*M. latipinna*) 24-48 hours = 22; 63 mg/L

LC₅₀ (mosquito fish) 24-48-96 hours = 23-22-56 mg/L

PHENOL (continued):

LC₅₀ (bluegill) 24-48-96 hours = 19-19-5.7 mg/L

LC₅₀ (goldfish) soft water 24-48-96 hours = 50-49-44 mg/L

LC₅₀ (guppy) soft water 24-48-96 hours = 50-50-39 mg/L

LC₅₀ (fathead) soft water 24-48-96 hours = 41-41-34 mg/L

LC₅₀ (fathead) hard water 24-48-96 hours = 39-39-32 mg/L

LC₅₀ (bluegill) soft water 24-48-96 hours = 26-24-24 mg/L

LC₅₀ (rainbow trout) 18 weeks = 4 mg/L

LC₅₀ (crucian carp) 24 hours = 25 mg/L

LC₅₀ (roach) 24 hours = 15 mg/L

LC₅₀ (tench) 24 hours = 17 mg/L

LC₅₀ (trout embryos) 24 hours = 5 mg/L

LC₅₀ (*Carassius auratus*) 48 hours = 44 mg/L

LC₅₀ (*Ophicephalus punctatus*) 48 hours = 46 mg/L

LC₅₀ (*Poecilia reticulata*) 24 hours = 30 ppm

LC₅₀ (*Poecilia reticulata* guppy) 14 days 0.23 mg/L

LC₅₀ (*Artemia salina*) 24 hours = 175 mg/L

LC₅₀ (*Streptocephalus proboscideus*) 24 hours = 11 mg/L

LC₅₀ (*Daphnia magna*) 24 hours = 7.8 mg/L

LC₅₀ (*Brachionus calyciflorus*) 24 hours = 1,204 mg/L

LC₅₀ (bluegill sunfish) 24 hours = 23 mg/L

LC₅₀ (*Brachydanio rerio*) 24-48-96 hours = 36-36-36 mg/L

LC₅₀ (fathead minnow) 24-96 hours = 8.2-5 mg/L

LC₅₀ (goldfish) 24 hours = 46 mg/L

LC₅₀,S (*Crassostrea virginica* mollusc) 48 hours = 58 ppm

LC₅₀,S (*Mercenaria mercenaria* mollusc) 48 hours = 52 ppm

LC₅₀,S (*Mercenaria mercenaria* mollusc) 12 days = 55 ppm

LC₅₀,S (bluegill) 24 hours = 19-160 mg/L

LC₅₀,S (rainbow trout) 24 hours = 5.6-11 mg/L

LC₅₀,S (goldfish) 24 hours = 60-200 mg/L

LC₅₀,S (golden shiner) 24 hours = 35-129 mg/L

LC₅₀,S (fathead minnow) 1-24-48-72-96 hours = > 50-> 50-> 50-33-32 mg/L

LC₅₀,S (golden shiner) 24 hours = 35-129 mg/L

LC₅₀,F (trout) 24-48-96 hours = 12-12-12 mg/L

LC₅₀,F (golden shiner) 48-96 hours = 41-36 mg/L (at 15°C)

LC₅₀,F (golden shiner) 48-96 hours = 28-24 mg/L (at 25°C)

LC₁₀₀ (*Tetrahyena pyriformis*) 24 hours = 600 mg/L

LC₁₀₀ (creek chub) = 20 mg/L

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

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

13. DISPOSAL CONSIDERATIONS

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 CODE NUMBER: Wastes of this material should be tested to see if they meet the criteria of D001 (Ignitability characteristic), D002 (Corrosive characteristic).

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.

PROPER SHIPPING NAME: Toxic in inhalation liquid, corrosive, n.o.s. (Acetic Acid, Phenol)

HAZARD CLASS NUMBER and DESCRIPTION: 6.1 (Toxic)

UN IDENTIFICATION NUMBER: UN 3389

PACKING GROUP: PG I

DOT LABEL(S) REQUIRED: Class 6.1 (Toxic); Class 8 (Corrosive)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): 154

INHALATION HAZARD ZONE: c

MARINE POLLUTANT: The components of this product are not classified by the DOT as 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. The use of the above U.S. DOT information from the U.S. 49 CFR regulations is allowed for shipments that originate in the U.S. For shipments via ground vehicle or rail that originate in Canada, the following information is applicable.

PROPER SHIPPING NAME: Toxic in inhalation liquid, corrosive, n.o.s. (Acetic Acid, Phenol)

HAZARD CLASS NUMBER and DESCRIPTION: 6.1 (Toxic); 8 (Corrosive)

UN IDENTIFICATION NUMBER: UN 3389

PACKING GROUP: PG I

HAZARD SHIPPING LABEL(S) REQUIRED: Class 6.1 (Toxic); Class 8 (Corrosive)

SPECIAL PROVISIONS: 16

EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX: 0.1

ERAP INDEX: None

PASSENGER CARRYING SHIP INDEX: None

PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX: 1000

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

UN IDENTIFICATION NUMBER: UN 3389

PROPER SHIPPING NAME: Toxic in inhalation liquid, corrosive, n.o.s. (Acetic Acid, Phenol)

HAZARD CLASS or DIVISION: 6.1 (Toxic); 8 (Corrosive)

HAZARD LABEL(S) REQUIRED: Class 6.1 (Toxic); Class 8 (Corrosive)

PACKING GROUP: I

PASSENGER and CARGO AIRCRAFT PACKING INSTRUCTION: Forbidden

PASSENGER and CARGO AIRCRAFT MAXIMUM NET QUANTITY PER PKG: Forbidden

PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY PACKING INSTRUCTION: None

PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY MAXIMUM NET QUANTITY PER PKG: None

CARGO AIRCRAFT ONLY PACKING INSTRUCTION: Forbidden

CARGO AIRCRAFT ONLY MAXIMUM NET QUANTITY PER PKG: Forbidden

SPECIAL PROVISIONS: None

ERG CODE: 6C

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)
Phenol	No	No	Yes

U.S. SARA SECTION 302 EXTREMELY HAZARDOUS THRESHOLD PLANNING QUANTITY (TPQ): Phenol = 500/1000 lb (270/454 kg)

U.S. SARA SECTION 304 EXTREMELY HAZARDOUS REPORTABLE QUANTITY (RQ): Phenol = 1000 lb (454 kg)

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. TSCA INVENTORY STATUS: The components listed by CAS# in Section 3 (Composition and Information on Ingredients) are listed on the TSCA Inventory.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Acetic Acid = 5000 lb (2270 kg); Phenol = 1000 lb (454 kg)

OTHER U.S. FEDERAL REGULATIONS:

- Acetic Acid is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.
- Phenol is listed as a hazardous air pollutant (HAP) generally known or suspected to cause serious health problems. The Clean Air Act, as amended in 1990, directs EPA to set standards requiring major sources to sharply reduce routine emissions of toxic pollutants. EPA is required to establish and phase in specific performance based standards for all air emission sources that emit one or more of the listed pollutants. Phenol is included on this list. Phenol has been designated as a hazardous air pollutant under section 112 of the Clean Air Act.
- Phenol is designated as a Toxic Pollutant pursuant to section 307(a)(1) of the Federal Water Pollution Control Act and is subject to effluent limitations. Phenol is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.
- Components are not Class I or Class II ozone depleting chemicals (40 CFR part 82).

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

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: The components listed by CAS# in Section 3 (Composition and Information on Ingredients) are on the DSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The Phenol component is on the CEPA Priority 2 Substances List.

CANADIAN WHMIS REGULATIONS: This product is categorized as a Controlled Product, Hazard Classes B3: Flammable and Combustible Material-Combustible liquid; D1A: Poisonous and Infectious Material-Acute & Chronic Effects-Very toxic; D2B: Poisonous and Infectious Material-Other effects-Toxic; E: Corrosive Material, as per the Controlled Product Regulations.

16. OTHER INFORMATION

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.

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
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(800)441-3365 • (619) 670-0609
Fax on Demand: 1-800/231-1366

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 Bioquip Products, 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.

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 that uniquely identifies each constituent.

EXPOSURE LIMITS IN AIR:

CEILING LEVEL: The concentration that shall not be exceeded during any part of the working exposure.

DFG MAK Germ Cell Mutagen Categories: **1:** Germ cell mutagens which have been shown to increase the mutant frequency in the progeny of exposed humans. **2:** Germ cell mutagens which have been shown to increase the mutant frequency in the progeny of exposed mammals. **3A:** Substances which have been shown to induce genetic damage in germ cells of human or animals, or which produce mutagenic effects in somatic cells of mammals *in vivo* and have been shown to reach the germ cells in an active form. **3B:** Substances which are suspected of being germ cell mutagens because of their genotoxic effects in mammalian somatic cell *in vivo*; in exceptional cases, substances for which there are no *in vivo* data, but which are clearly mutagenic *in vitro* and structurally related to known *in vivo* mutagens. **4:** Not applicable (Category 4 carcinogenic substances are those with non-genotoxic mechanisms of action. By definition, germ cell mutagens are genotoxic. Therefore, a Category 4 for germ cell mutagens cannot apply. At some time in the future, it is conceivable that a Category 4 could be established for genotoxic substances with primary targets other than DNA [e.g. purely aneugenic substances] if research results make this seem sensible.) **5:** Germ cell mutagens, the potency of which is considered to be so low that, provided the MAK value is observed, their contribution to genetic risk for humans is expected not to be significant.

DFG MAK Pregnancy Risk Group Classification: Group A: A risk of damage to the developing embryo or fetus has been unequivocally demonstrated. Exposure of pregnant women can cause damage of the developing organism, even when MAK and BAT (Biological Tolerance Value for Working Materials) values are observed. **Group B:** Currently available information indicates a risk of damage to the developing embryo or fetus must be considered to be probable. Damage to the developing organism cannot be excluded when pregnant women are exposed, even when MAK and BAT values are observed. **Group C:** There is no reason to fear a risk of damage to the developing embryo or fetus when MAK and BAT values are observed. **Group D:** Classification in one of the groups A-C is not yet possible because, although the data available may indicate a trend, **Group D:** Classification in one of the groups A-C is not yet possible because, although the data available may indicate a trend.

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.

LOQ: Limit of Quantitation.

MAK: Federal Republic of Germany Maximum Concentration Values in the workplace.

NE: Not Established. When no exposure guidelines are established, an entry of NE is made for reference.

NIC: Notice of Intended Change.

NIOSH CEILING: The exposure that shall not be exceeded during any part of the workday. If instantaneous monitoring is not feasible, the ceiling shall be assumed as a 15-minute TWA exposure (unless otherwise specified) that shall not be exceeded at any time during a workday.

NIOSH RELs: NIOSH's Recommended Exposure Limits.

PEL-Permissible Exposure Limit: OSHA's Permissible Exposure Limits. 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 that was vacated by Court Order.

SKIN: Used when a there is a danger of cutaneous absorption.

STEL-Short Term Exposure Limit: Short Term Exposure Limit, usually a 15-minute time-weighted average (TWA) exposure that should not be exceeded at any time during a workday, even if the 8-hr TWA is within the TLV-TWA, PEL-TWA or REL-TWA.

TLV-Threshold Limit Value: An airborne concentration of a substance that 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.

TWA-Time Weighted Average: Time Weighted Average exposure concentration for a conventional 8-hr (TLV, PEL) or up to a 10-hr (REL) workday and a 40-hr workweek.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM

HAZARD RATINGS: This rating system was developed by the National Paint and Coating Association and has been adopted by industry to identify the degree of chemical hazards.

HEALTH HAZARD:

0 (Minimal Hazard): No significant health risk, irritation of skin or eyes not anticipated. *Skin Irritation:* Essentially non-irritating. PII or Draize = "0". *Eye Irritation:* Essentially non-irritating, or minimal effects which clear in < 24 hours [e.g. mechanical irritation]. Draize = "0". *Oral Toxicity LD₅₀ Rat* < 5000 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit* < 2000 mg/kg. *Inhalation Toxicity 4-hrs LC₅₀ Rat* < 20 mg/L.; **1 (Slight Hazard):** Minor reversible injury may occur; slightly or mildly irritating. *Skin Irritation:* Slightly or mildly irritating. *Eye Irritation:* Slightly or mildly irritating. *Oral Toxicity LD₅₀ Rat* > 500-5000 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit* > 1000-2000 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat* > 2-20 mg/L) ; **2 (Moderate Hazard):** Temporary or transitory injury may occur. *Skin Irritation:* Moderately irritating; primary irritant; sensitizer. PII or Draize = 0, < 5. *Eye Irritation:* Moderately to severely irritating and/or corrosive; reversible corneal opacity; corneal involvement or irritation clearing in 8-21 days. Draize > 0, ≤ 25. *Oral Toxicity LD₅₀ Rat* > 50-500 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit* > 200-1000 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat* > 0.5-2 mg/L.) **3 (Serious Hazard):** Major injury likely unless prompt action is taken and medical treatment is given; high level of toxicity; corrosive. *Skin Irritation:* Severely irritating and/or corrosive; may destroy dermal tissue, cause skin burns, dermal necrosis. PII or Draize > 5-8 with destruction of tissue. *Eye Irritation:* Corrosive, irreversible destruction of ocular tissue; corneal involvement or irritation persisting for more than 21 days. Draize > 80 with effects irreversible in 21 days. *Oral Toxicity LD₅₀ Rat* > 1-50 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit* > 20-200 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat* > 0.05-0.5 mg/L.);

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM

HAZARD RATINGS (continued):

HEALTH HAZARD (continued):

4 (Severe Hazard): Life-threatening; major or permanent damage may result from single or repeated exposure. *Skin Irritation:* Not appropriate. Do not rate as a "4", based on skin irritation alone. *Eye Irritation:* Not appropriate. Do not rate as a "4", based on eye irritation alone. *Oral Toxicity LD₅₀ Rat* ≤ 1 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit* ≤ 20 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat* ≤ 0.05 mg/L).

FLAMMABILITY HAZARD:

0 (Minimal Hazard-Materials that will not burn in air when exposure to a temperature of 815.5°C [1500°F] for a period of 5 minutes.); **1 (Slight Hazard-Materials** that must be pre-heated before ignition can occur. Material require considerable pre-heating, under all ambient temperature conditions before ignition and combustion can occur, including: Materials that will burn in air when exposed to a temperature of 815.5°C (1500°F) for a period of 5 minutes or less; Liquids, solids and semisolids having a flash point at or above 93.3°C [200°F] (e.g. OSHA Class IIIB, or; Most ordinary combustible materials [e.g. wood, paper, etc.]; **2 (Moderate Hazard-Materials** that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not, under normal conditions, form hazardous atmospheres in air, but under high ambient temperatures or moderate heating may release vapor in sufficient quantities to produce hazardous atmospheres in air, including: Liquids having a flash-point at or above 37.8°C [100°F]; Solid materials in the form of course dusts that may burn rapidly but that generally do not form explosive atmospheres; Solid materials in a fibrous or shredded form that may burn rapidly and create flash fire hazards (e.g. cotton, sisal, hemp; Solids and semisolids that readily give off flammable vapors.); **3 (Serious Hazard- Liquids and solids** that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures, or, unaffected by ambient temperature, are readily ignited under almost all conditions, including: Liquids having a flash point below 22.8°C [73°F] and having a boiling point at or above 38°C [100°F] and below 37.8°C [100°F] [e.g. OSHA Class IB and IC]; Materials that on account of their physical form or environmental conditions can form explosive mixtures with air and are readily dispersed in air [e.g., dusts of combustible solids, mists or droplets of flammable liquids]; Materials that burn extremely rapidly, usually by reason of self-contained oxygen (e.g. dry nitrocellulose and many organic peroxides); **4 (Severe Hazard-Materials** that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air, and which will burn readily, including: Flammable gases; Flammable cryogenic materials; Any liquid or gaseous material that is liquid while under pressure and has a flash point below 22.8°C [73°F] and a boiling point below 37.8°C [100°F] [e.g. OSHA Class IA; Material that ignite spontaneously when exposed to air at a temperature of 54.4°C [130°F] or below [e.g. pyrophoric].

PHYSICAL HAZARD:

0 (Water Reactivity): Materials that do not react with water. *Organic Peroxides:* Materials that are normally stable, even under fire conditions and will not react with water. *Explosives:* Substances that are Non-Explosive. *Unstable Compressed Gases:* No Rating. *Pyrophorics:* No Rating. *Oxidizers:* No "0" rating allowed. *Unstable Reactives:* Substances that will not polymerize, decompose, condense or self-react.); **1 (Water Reactivity):** Materials that change or decompose upon exposure to moisture. *Organic Peroxides:* Materials that are normally stable, but can become unstable at high temperatures and pressures. These materials may react with water, but will not release energy. *Explosives:* Division 1.5 & 1.6 substances that are very insensitive explosives or that do not have a mass explosion hazard. *Compressed Gases:* Pressure below OSHA definition. *Pyrophorics:* No Rating. *Oxidizers:* Packaging Group III; *Solids:* any material that in either concentration tested, exhibits a mean burning time less than or equal to the mean burning time of a 3:7 potassium bromate/cellulose mixture and the criteria for Packing Group I and II are not met. *Liquids:* any material that exhibits a mean pressure rise time less than or equal to the pressure rise time of a 1:1 nitric acid (65%) / cellulose mixture and the criteria for Packing Group I and II are not met. *Unstable Reactives:* Substances that may decompose, condense or self-react, but only under conditions of high temperature and/or pressure and have little or no potential to cause significant heat generation or explosive hazard. Substances that readily undergo hazardous polymerization in the absence of inhibitors.); **3 (Water Reactivity):** Materials that may form explosive reactions with water. *Organic Peroxides:* Materials that are capable of detonation or explosive reaction, but require a strong initiating source, or must be heated under confinement before initiation; or materials that react explosively with water. *Explosives:* Division 1.2 – Explosive substances that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but do not have a mass explosion hazard. *Compressed Gases:* Pressure ≥ 514.7 psi absolute at 21.1°C (70°F) [500 psig]. *Pyrophorics:* No Rating. *Oxidizers:* Packing Group I *Solids:* any material that, in either concentration tested, exhibits a mean burning time less than the mean burning time of a 3:2 potassium bromate/cellulose mixture. *Liquids:* Any material that spontaneously ignites when mixed with cellulose in a 1:1 ratio, or which exhibits a mean pressure rise time less than the pressure rise time of a 1:1 perchloric acid (50%) / cellulose mixture. *Unstable Reactives:* Substances that may polymerize, decompose, condense or self-react at ambient temperature and/or pressure and have a moderate potential to cause significant heat generation or explosion.); **4 (Water Reactivity):** Materials that react explosively with water without requiring heat or confinement. *Organic Peroxides:* Materials that are readily capable of detonation or explosive decomposition at normal temperature and pressures. *Explosives:* Division 1.1 & 1.2-explosive substances that have a mass explosion hazard or have a projection hazard. A mass explosion is one that affects almost the entire load instantaneously. *Compressed Gases:* No Rating. *Pyrophorics:* Add to the definition of Flammability "4". *Oxidizers:* No "4" rating. *Unstable Reactives:* Substances that may polymerize, decompose, condense or self-react at ambient temperature and/or pressure and have a high potential to cause significant heat generation or explosion.).

DEFINITIONS OF TERMS (Continued)

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS:

HEALTH HAZARD: 0 (materials that, under emergency conditions, would offer no hazard beyond that of ordinary combustible materials): Gases and vapors whose LC₅₀ for acute inhalation toxicity is greater than 10,000 ppm. Dusts and mists whose LC₅₀ for acute inhalation toxicity is greater than 200 mg/L. Materials whose LD₅₀ for acute dermal toxicity is greater than 2000 mg/kg. Materials whose LD₅₀ for acute oral toxicity is greater than 2000 mg/kg. Materials that are essentially non-irritating to the respiratory tract, eyes and skin. **1** (materials that, under emergency conditions, can cause significant irritation): Gases and vapors whose LC₅₀ for acute inhalation toxicity is greater than 5,000 ppm but less than or equal to 10,000 ppm. Dusts and mists whose LC₅₀ for acute inhalation toxicity is greater than 10 mg/L but less than or equal to 200 mg/L. Materials whose LD₅₀ for acute dermal toxicity is greater than 1000 mg/kg but less than or equal to 2000 mg/kg. Materials whose LD₅₀ for acute oral toxicity is greater than 500 mg/kg but less than or equal to 2000 mg/kg. Materials that cause slight to moderate irritation to the respiratory tract, eyes and skin. **2** (materials that, under emergency conditions, can cause temporary incapacitation or residual injury): Gases and vapors whose LC₅₀ for acute inhalation toxicity is greater than 3,000 ppm but less than or equal to 5,000 ppm. Dusts and mists whose LC₅₀ for acute inhalation toxicity is greater than 2 mg/L but less than or equal to 10 mg/L. Materials whose LD₅₀ for acute dermal toxicity is greater than 200 mg/kg but less than or equal to 1000 mg/kg. Materials whose LD₅₀ for acute oral toxicity is greater than 50 mg/kg but less than or equal to 500 mg/kg. Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than one-fifth its LC₅₀ for acute inhalation toxicity, if its LC₅₀ is less than or equal to 5000 ppm and that does not meet the criteria for either degree of hazard 3 or degree of hazard 4. Compressed liquefied gases with boiling points between -30°C (-22°F) and -55°C (-66.5°F) that cause severe tissue damage, depending on duration of exposure. Materials that are respiratory irritants. Materials that cause severe, but reversible irritation to the eyes or are lachrymators. Materials that are primary skin irritants or sensitizers. **3** (materials that, under emergency conditions, can cause serious or permanent injury): Gases and vapors whose LC₅₀ for acute inhalation toxicity is greater than 1,000 ppm but less than or equal to 3,000 ppm. Dusts and mists whose LC₅₀ for acute inhalation toxicity is greater than 0.5 mg/L but less than or equal to 2 mg/L. Materials whose LD₅₀ for acute dermal toxicity is greater than 40 mg/kg but less than or equal to 200 mg/kg. Materials whose LD₅₀ for acute oral toxicity is greater than 5 mg/kg but less than or equal to 50 mg/kg. Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than one-fifth its LC₅₀ for acute inhalation toxicity, if its LC₅₀ is less than or equal to 3000 ppm and that does not meet the criteria for degree of hazard 4. Compressed liquefied gases with boiling points between -30°C (-22°F) and -55°C (-66.5°F) that cause frostbite and irreversible tissue damage. Materials that are respiratory irritants. Cryogenic gases that cause frostbite and irreversible tissue damage. Materials that are corrosive to the respiratory tract. Materials that are corrosive to the eyes or cause irreversible corneal opacity. Materials that are corrosive to the skin. **4** (materials that, under emergency conditions, can be lethal): Gases and vapors whose LC₅₀ for acute inhalation toxicity is less than or equal to 1,000 ppm. Dusts and mists whose LC₅₀ for acute inhalation toxicity is less than or equal to 0.5 mg/L. Materials whose LD₅₀ for acute dermal toxicity is less than or equal to 40 mg/kg. Materials whose LD₅₀ for acute oral toxicity is less than or equal to 5 mg/kg. Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than one-fifth its LC₅₀ for acute inhalation toxicity, if its LC₅₀ is less than or equal to 1000 ppm.

FLAMMABILITY HAZARD: 0 Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand: Materials that will not burn in air when exposed to a temperature of 816°C (1500°F) for a period of 5 minutes in accordance with Annex D. **1** Materials that must be preheated before ignition can occur. Materials in this degree require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur: Materials that will burn in air when exposed to a temperature of 816°C (1500°F) for a period of 5 minutes in accordance with Annex D. Liquids, solids and semisolids having a flash point at or above 93.4°C (200°F) (i.e. Class IIIB liquids). Liquids with a flash point greater than 35°C (95°F) that do not sustain combustion when tested using the *Method of Testing for Sustained Combustibility*, per 49 CFR 173, Appendix H or the UN *Recommendation on the Transport of Dangerous Goods, Model Regulations* (current edition) and the related *Manual of Tests and Criteria* (current edition). Liquids with a flash point greater than 35°C (95°F) in a water-miscible solution or dispersion with a water non-combustible liquid/solid content of more than 85 percent by weight. Liquids that have no fire point when tested by ASTM D 92 Standard Test Method for Flash and Fire Points by Cleveland Open Cup, up to a boiling point of the liquid or up to a temperature at which the sample being tested shows an obvious physical change. Combustible pellets with a representative diameter of greater than 2 mm (10 mesh). Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. Most ordinary combustible materials. **2** Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating could release vapor in sufficient quantities to produce hazardous atmospheres with air: Liquids having a flash point at or above 37.8°C (100°F) and below 93.4°C (200°F) (i.e. Class II and Class IIIA liquids.) Solid materials in the form of powders or coarse dusts of representative diameter between 420 microns (40 mesh) and 2 mm (10 mesh) that burn rapidly but that generally do not form explosive mixtures in air. Solid materials in fibrous or shredded form that burn rapidly and create flash fire hazards, such as cotton, sisal and hemp. Solids and semisolids that readily give off flammable vapors. Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent.

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS (continued):

FLAMMABILITY HAZARD (continued): 3 Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures or, though unaffected by ambient temperatures, are readily ignited under almost all conditions: Liquids having a flash point below 22.8°C (73°F) and having a boiling point at or above 37.8°C (100°F) and those liquids having a flash point at or above 22.8°C (73°F) and below 37.8°C (73°F) and below 37.8°C (100°F) (i.e. Class IB and IC liquids). Materials that, on account of their physical form or environmental conditions, can form explosive mixtures with air and are readily dispersed in air. Flammable or combustible dusts with a representative diameter less than 420 microns (40 mesh). Materials that burn with extreme rapidity, usually by reason of self-contained oxygen (e.g. dry nitrocellulose and many organic peroxides). Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent. **4** Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and will burn readily; Flammable gases. Flammable cryogenic materials. Any liquid or gaseous materials that is liquid while under pressure and has a flash point below 22.8°C (73°F) and a boiling point below 37.8°C (100°F) (i.e. Class IA liquids). Materials that ignite when exposed to air, Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent.

INSTABILITY HAZARD: 0 Materials that in themselves are normally stable, even under fire conditions: Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) below 0.01 W/mL. Materials that do not exhibit an exotherm at temperatures less than or equal to 500°C (932°F) when tested by differential scanning calorimetry. **1** Materials that in themselves are normally stable, but that can become unstable at elevated temperatures and pressures: Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 0.01 W/mL and below 10 W/mL. **2** Materials that readily undergo violent chemical change at elevated temperatures and pressures: Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 10 W/mL and below 100W/mL. Materials that in themselves are capable of detonation or explosive decomposition or explosive reaction, but that require a strong initiating source or that must be heated under confinement before initiation: Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 100 W/mL and below 1000 W/mL. Materials that are sensitive to thermal or mechanical shock at elevated temperatures and pressures. **4** Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures: Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) of 1000 W/mL or greater. Materials that are sensitive to localized thermal or mechanical shock at normal temperatures and pressures.

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:

Human and Animal Toxicology: 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: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - 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/m³** 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. 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. **Cancer Information:** 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 Information:** **BEI** - ACGIH 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.

DEFINITIONS OF TERMS (Continued)

ECOLOGICAL INFORMATION:

EC is the effect concentration in water. **BCF** = Bioconcentration Factor, which is used to determine if a substance will concentrate in lifeforms which consume contaminated plant or animal matter. **TL_m** = median threshold limit; Coefficient of Oil/Water Distribution is represented by **log K_{ow}** or **log K_{oc}** and is used to assess a substance's behavior in the environment.

REGULATORY INFORMATION:

U.S. and CANADA:

This section explains the impact of various laws and regulations on the material. **ACGIH**: American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **EPA** is the U.S. Environmental Protection Agency. **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**). **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/NDL**); 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. This section also includes information on the precautionary warnings which appear on the material's package label. **OSHA** - U.S. Occupational Safety and Health Administration.