SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards, REACH, European Union CLP EC 1272/2008, and the Global Harmonization Standard

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

IDENTIFICATION of the SUBSTANCE or PREPARATION:

Trade/Material Name: **25mg of Ascorbic Acid / 200 Maleic Acid for method 524.3**
Chemical Names, Common Names: Ascorbic Acid & Maleic Acid Mixture
Synonyms: None
Product Use: Heating Element
Molecular Formula: Not Applicable

COMPANY/UNDERTAKING IDENTIFICATION:

U.S. Manufacturer's Name: EP Scientific Products/ThermoFisher
Address: 520 North Main Street
Miami, OK 74354
Business Phone: 1-(828)-658-2711
Emergency Phone: CHEMTREC: 1-800-424-9300 (U.S./Canada/Puerto Rico) [24-hours]
CHEMTREC: +1-703-527-3887 (Outside North America) [24-hours]

EMAIL ADDRESS FOR PRODUCT INFORMATION: cservice@epscientific.com

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 SDS contains all the information required by the CPR. The product is also classified per all applicable EU Directives through EC 1907: 2006, the European Union CLP EC 1272/2008 and the Global Harmonization Standard.

2. HAZARD IDENTIFICATION

GLOBAL HARMONIZATION AND EU CLP REGULATION (EC) 1272/2208 LABELING AND CLASSIFICATION: This product has been classified per GHS Standards under European regulations. For information on EU classification under (67/548/EEC), see below. This is a self-classification.

Classification: Classification: Acute Oral Toxicity Category 4, Eye Irritation Category 2, STOT SE (Inhalation) Category 3, Skin Irritation Category 2, Skin Sensitisation Category 1

Signal Word: Warning **Hazard Statement Codes:** H302, H315, H319, H335, H317

Precautionary Statement Codes: P261, P264, P270, P271, P272, P280, P301 + P312, P330, P302 + P352, P333 + P313, P362 + P364, P305 + P351 + P338, P337 + P313, P304 + P340, P312, P321, P403 + P233, P405, P501

Hazard Symbols/Pictograms: GHS07

EU LABELING AND CLASSIFICATION 67/548/EEC: This product has been classified as per European Community Council Directive 67/548/EEC or subsequent Directives. This is a self-classification.

Classification: Harmful, Irritant **Risk Phrases Codes:** R22, R36/37/38, R43

Safety Phrase Codes: S24, S26, S28, S36/37/39, S45, S46

Hazard Symbols: Xn/Xi

See Section 16 for full text of Classification

EMERGENCY OVERVIEW: Product Description: This product is white crystalline to powdered solid with a slight acrid odor. **Health Hazards:** Harmful if swallowed. This product can cause moderate to severe irritation to the skin and eyes. Solutions may cause permanent damage to the eyes and scarring of skin. Severity of corrosive effect depends on concentration and duration of exposure. May cause respiratory irritation by inhalation. Prolonged or repeated contact with dusts or dilute solutions may result in redness, swelling, and thickening of the skin (dermatitis). This product may cause sensitization of the skin and allergic reaction in susceptible individuals. **Flammability Hazards:** This product is combustible and can ignite if exposed to direct flame or other ignition source or very high temperatures. Finely divided dust clouds from the product may form explosive air/dust mixtures. If involved in a fire, this product may produce carbon oxides, fumaric acid and maleic anhydride. **Reactivity Hazards:** This product is not reactive. **Environmental Hazards:** Although this product presents minimal environmental hazard, all intentional and accidental release should be avoided. **Emergency Considerations:** Emergency responders should wear appropriate protection for situation to which they respond.

3. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	EINECS#	WT%	LABEL ELEMENTS EU Classification (67/548/EEC) GHS & EU Classification (1272/2008 EC) Risk Phrases/Hazard Statements

L-Ascorbic Acid	50-81-7	200-066-2	75.0-90.0%	SELF CLASSIFICATION EU 67/548 Classification: Irritant Risk Phrase Codes: R36/37/38 GHS & EU 1272/2008 Classification: Acute Oral Toxicity Cat. 5, Skin Irritation Cat. 2, Eye Irritation Cat. 1A, STOT (Inhalation-Respiratory Irritation) SE Cat. 3 Hazard Statement Codes: H303, H315, H319, H335

See Section 16 for classification information

3. COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

CHEMICAL NAME	CAS #	EINECS#	WT%	LABEL ELEMENTS EU Classification (67/548/EEC) GHS & EU Classification (1272/2008 EC) Risk Phrases/Hazard Statements
Maleic Acid	110-16-7	203-742-5	8.0-12.0%	PUBLISHED CLASSIFICATION EU 67/548 Classification: Harmful, Irritant Risk Phrase Codes: R22, R36/37/38, R43 GHS & EU 1272/2008 Classification: Acute Oral Toxicity Cat. 4, Skin Irritation Cat. 2, Eye Irritation Cat. 1A, STOT (Inhalation-Respiratory Irritation) SE Cat. 3, Skin Sensitization Cat. 1 Hazard Statement Codes: H302, H315, H319, H335, H317

See Section 16 for classification information

4. FIRST-AID MEASURES

DESCRIPTION OF FIRST AID MEASURES: All first aid procedures should be periodically reviewed by a doctor familiar with the material and its conditions of use in the workplace. Provide general supportive measures (comfort, warmth, rest). Consult a doctor and/or the nearest Poison Control Centre for all exposure except minor instances of inhalation or skin contact. Take a copy of label and SDS to physician or health professional with the contaminated individual.

Inhalation: If dusts or fumes from of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. If breathing is difficult, give oxygen. Seek medical attention if adverse effect occurs after removal to fresh air.

Skin Exposure: If skin contact causes irritation, flush with running water. Under running water, remove contaminated clothing, shoes, and leather goods (e.g., watchbands, belts). Transport victim to an emergency care facility immediately. Discard contaminated clothing, shoes and leather goods. DO NOT reuse. Seek medical attention if adverse effects occur after flushing.

Eye Exposure: Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for at least 20 minutes, by the clock, while holding the eyelid(s) open. Have victim "roll" eyes. Neutral saline solution may be used as soon as it is available. DO NOT INTERRUPT FLUSHING. If necessary, keep emergency vehicle waiting. Take care not to rinse contaminated water into the non-affected eye or onto the face. If irritation persists, repeat flushing. Quickly transport victim to an emergency care facility.

Ingestion Exposure: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. NEVER give anything by mouth if victim is rapidly losing consciousness, is unconscious or is convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 240 to 300 mL (8 to 10 oz.) of water to dilute material in stomach. If milk is available, it may be administered AFTER the water has been given. If vomiting occurs naturally, rinse mouth and repeat administration of water. Quickly transport victim to an emergency care facility.

PROTECTION OF FIRST AID RESPONDERS: See Sections 6 (Accidental Release Measures) and 8 (Exposure Controls-Personal Protection).

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, respiratory or kidney disorders may be aggravated by exposure to this product.

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT IF NEEDED: Treat symptoms and eliminate exposure.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not determined for product. For Ascorbic Acid: 660°C (1220°F)

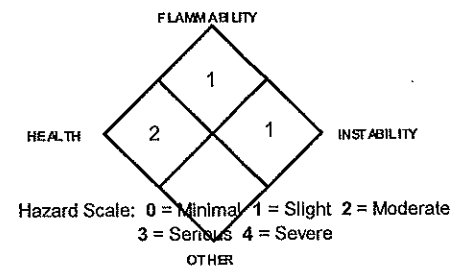
FLAMMABLE LIMITS (in air by volume, %): Not applicable.

FIRE EXTINGUISHING MEDIA: Use fire extinguishing materials appropriate for surrounding materials.

UNSUITABLE FIRE EXTINGUISHING MEDIA: None known.

SPECIAL HAZARDS ARISING FROM THE PRODUCT: When involved in a fire, this product may decompose and produce irritating fumes and toxic gases (e.g., carbon oxides, fumaric acid and maleic anhydride). The Ascorbic Acid component is a strong reducing agent; contact with oxidizers can result in a fire or explosion hazard. Finely divided dust clouds from the product may form explosive air/dust mixtures.

NFPA RATING



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

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Large dust clouds from product have the potential to ignite explosively. Refer to NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*, for comprehensive guidance.

SPECIAL PROTECTIVE ACTIONS FOR FIRE-FIGHTERS: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move containers from fire area if it can be done without risk to personnel.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES: Proper protective equipment should be used. In the event of a spill, clear the area and protect people. Eliminate all sources of ignition. Non-sparking tools should be used. 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 personnel can be allowed into the area without Self-Contained Breathing Apparatus (SCBA).Call CHEMTREC (1-800-424-9300) for emergency assistance. Or if in Canada, call CANUTEC (613-996-6666).

PROTECTIVE EQUIPMENT:

Small Spills: Wear rubber gloves, splash goggles, and appropriate body protection.

Large Spills: Minimum Personal Protective Equipment should be rubber gloves, rubber boots, face shield, and Tyvek suit. Minimum level of personal protective equipment for releases in which the level of oxygen is less than 19.5% or is unknown must be **Level B: triple-gloves (rubber gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard hat, and Self-Contained Breathing Apparatus.**

METHODS FOR CLEAN-UP AND CONTAINMENT:

Small Spills: Sweep-up or vacuum-up spilled solid. Place in appropriate container for disposal. Clean spill area with thoroughly with water and absorb any residual material and moisture with polypropylene pads or other appropriate material.

Large Spills: Trained personnel following pre-planned procedures should handle non-incidental releases. Dry sweeping is not recommended. Pre-damping the material or use of a vacuum is preferred. Minimize the generation of airborne dusts. Shovel into clean, dry, labeled containers and cover.

ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewer or confined spaces, waterways, soil or public waters. Do not flush to sewer. For spills on water, contain, minimize dispersion and collect.

REFERENCE TO OTHER SECTIONS: See Section 13, Disposal Considerations for more information.

7. HANDLING and USE

PRECAUTIONS FOR SAFE HANDLING: All employees who handle this material should be trained to handle it safely. 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. Use in a well-ventilated location. If during the use of this product, dusts or particulates are generated, avoid breathing, or skin or eye contact. Use in a well-ventilated location, segregated from other materials and operations. Open containers slowly on a stable surface. Containers of this product must be properly labeled. Areas in which this product is used should be wiped down, so that this product does not accumulate. Refer to NFPA 654, *Prevention of Fire and Dust Explosions from the Manufacturing, Processing and Handling of Combustible Particulate Solids* for additional information on handling and storage.

CONDITIONS FOR SAFE STORAGE: Store in sealed containers. Store this product in a cool, dry location, away from sources of intense heat. Store away from incompatible materials (see Section 10, Stability and Reactivity) and moisture. If during the use of this product, dusts or particulates are generated, avoid breathing, or skin or eye contact. Use in a well-ventilated location, segregated from other materials and operations. Contact with water can result in generation of carbon dioxide and may cause closed containers to burst. Have appropriate extinguishing equipment in the storage area (e.g., sprinkler system, portable fire extinguishers). Storage facilities should be made of fire resistant materials. Walls, floors, shelving and lighting systems in the storage area should be made from materials that resist attack from Maleic Acid.

SPECIFIC END USE(S): This product is used as a heating element. Follow all industry standards for use of this product.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: When cleaning non-disposable equipment, wear latex or butyl rubber (double gloving is recommended), goggles, and lab coat. Wash equipment with soap and water. Wipe equipment down with damp sponge or polypad. Collect all rinsates and dispose of according to applicable Federal, State, and local procedures standards.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/CONTROL PARAMETERS:

Ventilation and Engineering Controls: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below, if applicable. Ensure eyewash/safety shower stations are available near areas where this product is used.

Occupational/Workplace Exposure Limits/Guidelines:

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR							
		ACGIH-TLVs		OSHA-PELs		NIOSH-RELs		NIOSH	OTHER
		TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
Ascorbic Acid	50-81-7	NE	NE	15 or 50 (total dust), 5 or 15 mppcf (respirable fraction)	NE	NE	NE	NE	DFG MAK: TWA: 4 (inhalable fraction).
Maleic Acid	110-16-7								
No exposure limits are in place for components. It is recommended that exposure limits for									

Particulates Not Otherwise Classified/Regulated be followed.								

NE = Not Established. mppcf = Millions of Particles per Cubic Foot

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

EXPOSURE LIMITS/CONTROL PARAMETERS (continued):

International Exposure Limits: Currently, the following international exposure limits are in place some components of this product. This may not be a complete list and exposure limits change and should be checked for currency.

ASCORBIC ACID:

Russia: STEL = 2 mg/m^3, JUN 2003

PROTECTIVE EQUIPMENT: *The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132, including* U.S. Federal OSHA Respiratory Protection (29 CFR 1910.134), OSHA Eye Protection 29 CFR 1910.133, OSHA Hard Protection 29 CFR 1910.138, OSHA Foot Protection 29 CFR 1910.136 and OSHA Body Protection 29 CFR1910.132), *equivalent standards of Canada (including CSA Respiratory Standard Z94.4-02,* Z94.3-M1982, *Industrial Eye and Face Protectors and* CSA Standard Z195-02, *Protective Footwear), or standards of EU member states (including EN 529:2005 for respiratory PPE, CEN/TR 15419:2006 for hand protection, and CR 13464:1999 for face/eye protection). Please reference applicable regulations and standards for relevant details.*

Respiratory Protection: Maintain airborne contaminant concentrations below limits listed above, if applicable. In instances where inhalable aerosols may be generated and respiratory protection is necessary, use only respiratory protection authorized under appropriate regulations. In the U.S., 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. Splash goggles and faceshield should be considered when handling solutions made from this product. If necessary, refer to appropriate country regulations and standards for further information.

Hand Protection: Use butyl rubber, Teflon, Viton, Saranex, or Responder gloves for routine industrial use. Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this SDS. If necessary, refer to applicable regulations.

Body Protection: Use body protection appropriate for task. Full-body chemical protective clothing is recommended for emergency response procedures. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection. Refer to appropriate country regulations and standards for further information.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is available for the product:

FORM: Crystalline, powdered solid.

COLOR: White.

ODOR: Slight acrid.

ODOR THRESHOLD: Not available.

HOW TO DETECT THIS SUBSTANCE (identification properties): The appearance of this product may be an identifying property in event of accidental release.

The following values are for the component of greatest percentage, Ascorbic Acid:

FORM: Crystalline, powdered solid.

COLOR: White to yellow.

MOLECULAR WEIGHT: 176.13

MOLECULAR FORMULA: $C_6H_8O_6$

SPECIFIC GRAVITY/DENSITY: 1.65

pH: 2.1-2.6 (5% solution)

ODOR: Slight acrid.

ODOR THRESHOLD: Not available.

VAPOR DENSITY (air= 1): Not applicable.

VISCOSITY: Not applicable.

SATURATION VAPOR CONCENTRATION: Not available.

VAPOR PRESSURE (air = 1) @ 465.15°K: 7.9179 Pa

BOILING POINT: Not available.

FREEZING/MELTING POINT: 190°C (374°F)

DECOMPOSITION TEMPERATURE: 190°C (374°F)

OXIDIZING PROPERTIES: Not an oxidizer.

SOLUBILITY IN WATER @ 45°C: 40 g/100 mL

EVAPORATION RATE (water = 1): Not applicable.

OTHER SOLUBILITIES: Soluble in ethanol, absolute alcohol and glycerol.

COEFFICIENT WATER/OIL DISTRIBUTION: Log Kow = -2.15 @ 23°C; Log Kow = -2.00 @ 37°C

10. STABILITY and REACTIVITY

CHEMICAL STABILITY: Stable under conditions of normal temperature. Above 100°C (212°F), this product will form maleic anhydride and may also, convert to fumaric acid slowly at temperatures as low as 100°C (212°F) and will readily do so at 138°C [280.4°F] (the melting point of Maleic Acid). In concentrations greater than 100 mg/mL, the Ascorbic Acid component may undergo decomposition with the production of carbon dioxide. Since increased pressure may develop after prolonged storage, containers of this product should be opened carefully.

DECOMPOSITION PRODUCTS: ***Combustion:*** If exposed to extremely high temperatures, thermal decomposition may generate irritating fumes and toxic gases (e.g. carbon oxides, fumaric acid and maleic anhydride). ***Hydrolysis:*** None.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product is incompatible with strong oxidizing agents (e.g. perchlorates, peroxides, chromates, sodium hypochlorite), active metals (e.g. aluminum, iron, zinc, strong bases (including alkalis such as sodium hydroxide), amines or alkali metals, strong reducing agents (e.g. phosphorus, tin (ii) chloride, metal hydrides), alkali hydroxides, alkalis, iron, copper, sodium salicylate, sodium nitrite, theobromine and methenamine. This product may be corrosive to some metals.

POSSIBILITY OF HAZARDOUS REACTIONS OR POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid extreme temperatures and incompatible chemicals.

11. TOXICOLOGICAL INFORMATION

SYMPTOMS OF EXPOSURE BY ROUTE OF EXPOSURE: The health hazard information provided below is pertinent to employees using this product in an occupational setting. The following paragraphs describe the symptoms of exposure by route of exposure.

Inhalation: Inhalation of dusts or particulates from this product may cause moderate irritation of the respiratory system. Any corrosive effect would be related to concentration and duration of exposure. Chronic inhalation may cause damage to the respiratory system.

Contact with Skin or Eyes: Eye contact may cause moderate to severe irritation. Permanent damage or blindness may result. Depending on concentration or duration of exposure skin exposure may cause moderate to severe irritation, especially in solutions. Prolonged or repeated contact with dusts or dilute solutions may result in redness, swelling, and thickening of the skin (dermatitis).

Skin Absorption: Because of possible skin sensitization, this product poses a hazard of skin absorption.

Ingestion: Ingestion is not anticipated to be a likely route of occupational exposure for this product. Toxic effects, including deaths, have been observed following ingestion of high concentrations of the Maleic Acid component in the diet. Animal studies indicate ingestion of Maleic Acid may cause damage to the kidneys. However, these high doses are not considered relevant to occupational exposure.

Injection: Injection is a not likely route of exposure for this product.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	2*
FLAMMABILITY HAZARD	(RED)	1
PHYSICAL HAZARD	(YELLOW)	1

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		SEE SECTION 8

For Routine Industrial Use and Handling Applications

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

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

Acute: Eye contact may cause moderate to severe irritation or burns to the eyes. Permanent damage may result. Depending on concentration and duration of exposure, skin contact and inhalation may cause moderate to severe irritation.

Chronic: Repeated or prolonged inhalation of dusts may cause adverse effects on the respiratory system. Chronic skin exposure may result in dermatitis.

TARGET ORGANS: **Acute:** Respiratory system, skin, eyes. **Chronic:** Skin.

TOXICITY DATA: Currently, the following toxicity data are available for components of this product in 1% concentration or greater.

ASCORBIC ACID:

TDLo (Intravenous-Man) 2300 mg/kg/2 days: Blood: oxidant related (GPD deficient) anemia

TDLo (Intravenous-Woman) 900 mg/kg: Kidney/Ureter/Bladder: changes in tubules (including acute renal failure, acute tubular necrosis)

TDLo (Oral-Human) 72.96 gm/kg/313 weeks-continuous: Tumorigenic: active as anti-cancer agent

TDLo (Oral-Human) 600 mg/kg/14 days-intermittent: Vascular: BP lowering not characterized in autonomic section; Endocrine: other changes

LD_{50} (Oral-Rat) 11,900 mg/kg: Sense Organs and Special Senses (Eye): lacrymation; Behavioral: somnolence (general depressed activity); Gastrointestinal: hypermotility, diarrhea

LD_{50} (Oral-Rat) 11.9 gm/kg: Behavioral: muscle contraction or spasticity; Lungs, Thorax, or Respiration: dyspnea; Nutritional and Gross Metabolic: body temperature decrease

LD_{50} (Oral-Mouse) 3367 mg/kg

LD_{50} (Oral-Mouse) 250 mg/kg: Nutritional and Gross Metabolic: other changes

LD_{50} (Subcutaneous-Rat) > 10 gm/kg

LD_{50} (Intraperitoneal-Rat) 643 mg/kg

LD_{50} (Intravenous-Rat) > 4 gm/kg: Behavioral: altered sleep time (including change in righting reflex), somnolence (general depressed activity)

LD_{50} (Intravenous-Mouse) 518 mg/kg

TDLo (Oral-Rat) 455 gm/kg/13 weeks-continuous: Blood: changes in bone marrow (not otherwise specified); Nutritional and Gross Metabolic: weight loss or decreased weight gain

TDLo (Oral-Rat) 546 gm/kg/13 weeks-intermittent: Related to Chronic Data: death

TDLo (Oral-Rat) 2500 mg/kg/10 days-intermittent: Endocrine: hyperglycemia; Blood: other changes

TDLo (Oral-Rat) 7000 mg/kg/28 days-intermittent: Endocrine: changes in gonadotropins; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects; Related to Chronic Data: changes in ovarian weight

TDLo (Oral-Rat) 1200 mg/kg/30 days-intermittent: Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects

TDLo (Oral-Rat) 769 mg/kg/25 days-intermittent: Lungs, Thorax, or Respiration: other changes; Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects

TDLo (Oral-Rat) 2240 mg/kg/16 weeks-intermittent: Liver: other changes; Blood: changes in erythrocyte (RBC) count; Biochemical: Metabolism (Intermediary): lipids including transport

ASCORBIC ACID (continued):

TDLo (Oral-Rat) 2100 mg/kg/12 weeks-intermittent: Liver: other changes; Kidney/Ureter/Bladder: other changes; Biochemical: Metabolism (Intermediary): lipids including transport

TDLo (Oral-Rat) 2800 mg/kg/4 weeks-intermittent: Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: hepatic microsomal mixed oxidase (dealkylation, hydroxylation, etc.)

TDLo (Oral-Rat) 11,200 mg/kg/4 weeks-intermittent: Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol); Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: transaminases

TDLo (Oral-Rat) 5600 mg/kg/4 weeks-intermittent: Kidney/Ureter/Bladder: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: cytochrome oxidases (including oxidative phosphorylation)

TDLo (Oral-Rat) 3000 mg/kg/30 days-intermittent: Endocrine: changes in luteinizing hormone, changes in gonadotropins; Reproductive: Paternal Effects: testes, epididymis, sperm duct

TDLo (Oral-Rat) 3000 mg/kg/30 days-intermittent: Brain and Coverings: changes in brain weight; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects

TDLo (Oral-Rat) 300 mg/kg/30 days-intermittent: Musculoskeletal: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects

TDLo (Oral-Rat) 4000 mg/kg/20 days-intermittent: Behavioral: altered sleep time (including change in righting reflex)

TDLo (Oral-Rat) 20,160 mg/kg/28 days-continuous: Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects

TDLo (Oral-Rat) 1,802,500 mg/kg/103 weeks-continuous: Tumorigenic: carcinogenic by RTECS criteria; Blood: leukemia

TDLo (Oral-Rat) 2500 mg/kg: female 1-22 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants)

TDLo (Oral-Mouse) 100 mg/kg: Liver: other changes

TDLo (Oral-Mouse) 18,000 mg/kg/30 days-intermittent: Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects, Metabolism (Intermediary): lipids including transport

TDLo (Oral-Mouse) 210 mg/kg/2 weeks-continuous: Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: hepatic microsomal mixed oxidase (dealkylation, hydroxylation, etc.)

TDLo (Oral-Mouse) 480,000 mg/kg/480 days-continuous: Tumorigenic: facilitates action of known carcinogen

11. TOXICOLOGICAL INFORMATION (Continued)

TOXICITY DATA (continued):

ASCORBIC ACID (continued):

TDLo (Oral-Mouse) 3000 mg/kg/30 days-intermittent: Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects

TDLo (Oral-Rabbit) 1680 mg/kg/12 weeks-intermittent: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count), impotence, other effects on male

TDLo (Oral-Rabbit) 4480 mg/kg/16 weeks-intermittent: Behavioral: food intake (animal); Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count); Related to Chronic Data: changes in testicular weight

TDLo (Oral-Rabbit) 1680 mg/kg/12 weeks-intermittent: Blood: changes in serum composition (e.g. TP, billrubin, cholesterol); Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects

TDLo (Oral-Guinea Pig) 19,500 mg/kg: female 30-58 day(s) after conception lactating female 10 day(s) post-birth: Reproductive: Effects on Newborn: biochemical and metabolic

TDLo (Oral-Guinea Pig) 5800 mg/kg: female 1-58 day(s) after conception: Reproductive: Effects on Newborn: stillbirth, viability index (e.g., # alive at day 4 per # born alive)

TDLo (Oral-Guinea Pig) 2471 mg/kg: Multi-generations: Reproductive: Effects on Newborn: growth statistics (e.g.%, reduced weight gain)

TDLo (Oral-Monkey) 6000 mg/kg/30 days-continuous: Reproductive: Paternal Effects: other effects on male; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: multiple enzyme effects

TDLo (Skin-Mouse) 50 mg/kg: Immunological Including Allergic: increase in cellular immune response

TDLo (Skin-Mouse) 500 mg/kg/10 days-intermittent: Biochemical: Metabolism (Intermediary): effect on inflammation or mediation of inflammation

TDLo (Skin-Mouse) 120 gm/kg/30 days-intermittent: Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: other oxidoreductases

TDLo (Intraperitoneal-Mouse) 90 mg/kg: Behavioral: rigidity (including catalepsy)

TDLo (Intraperitoneal-Mouse) 750 mg/kg/3 days-intermittent: Liver: other changes; Biochemical: Metabolism (Intermediary): lipids including transport

TDLo (Intraperitoneal-Mouse) 6680 mg/kg: female 11 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetal death

TDLo (Intravenous-Rat) 300 mg/kg/3 days-intermittent: Liver: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: hepatic microsomal mixed oxidase (dealkylation, hydroxylation, etc.), Enzyme inhibition, induction, or change in blood or tissue levels: transaminases

TDLo (Intravenous-Mouse) 800 mg/kg: female 8 day(s) after conception: Reproductive: Specific Developmental Abnormalities: Central Nervous System, musculoskeletal system

TDLo (Intravenous-Cattle) 500 mg/kg: Nutritional and Gross Metabolic: metabolic acidosis

ASCORBIC ACID (continued):

TDLo (Intravenous-Cattle) 500 mg/kg: Peripheral Nerve and Sensation: fasciculations; Sense Organs and Special Senses (Eye): mydriasis (pupillary dilation); Cardiac: pulse rate increase, without fall in BP

TDLo (Intravenous-Cattle) 500 mg/kg: Lungs, Thorax, or Respiration: respiratory stimulation; Kidney/Ureter/Bladder: urine volume increased, other changes in urine composition

TDLo (Parenteral-Rat) 28 gm/kg/7 days-continuous: Vascular: BP lowering not characterized in autonomic section, other changes; Biochemical: Metabolism (Intermediary): lipids including transport

DNA Damage (Human Fibroblast) 200 µmol/L

DNA Damage (Human Cells-Not Otherwise Specified) 200 µmol/L

DNA Damage (Human Cells-Not Otherwise Specified) 300 µmol/L/30 minutes

DNA Inhibition (Human HeLa cell) 2500 µmol/L

DNA Inhibition (Human-Not Otherwise Specified) 200 µmol/L

DNA Inhibition (Human Cells-Not Otherwise Specified) 200 mg/L

Mutation Test Systems-Not Otherwise Specified (Human Fibroblast) 200 µmol/L

Mutation Test Systems-Not Otherwise Specified (Human Cells-Not Otherwise Specified) 200 µmol/L

Mutation in Microorganisms (Bacteria-*Salmonella typhimurium*) 500 µg/plate

Mutation in Microorganisms (Microorganism-Not Otherwise Specified) 1000 ppm

Mutation in Microorganisms (Mold-*Neurospora crassa*) 2 mmol/L

DNA Damage (Bacteria-*Bacillus subtilis*) 2 mg/disc

DNA Damage (Mammal-Species Unspecified Lymphocyte) 500 µmol/L

DNA Damage (Oral-Mouse) 1 mg/kg1 mg/kg

DNA Repair (Yeast-*Saccharomyces cerevisiae*) 100 mg/L

Gene Conversion and Mitotic Recombination (Yeast-*Saccharomyces cerevisiae*) 300 mg/L

Sex Chromosome Loss and Non-Disjunction (Yeast-*Saccharomyces cerevisiae*) 100 mg/L

Sperm Morphology (Parenteral-Silkworm) 25 µg

Micronucleus Test (Intraperitoneal-Mouse) 4500 mg/kg/3 days-continuous

Micronucleus Test (Hamster Ovary) 400 mg/L

Micronucleus Test (Oral-Mouse) 30 mg/kg

Mutation Test Systems-Not Otherwise Specified (Mouse-Liver) 500 µmol/L

Cytogenetic Analysis (Intraperitoneal-Mouse) 1600 mg/kg

Cytogenetic Analysis (Hamster Ovary) 300 mg/L

Sister Chromatid Exchange (Intraperitoneal-Mouse) 1600 mg/kg

Sister Chromatid Exchange (Hamster Ovary) 500 mg/L

MALEIC ACID:

Standard Draize Test (Eye-Rabbit) 1%/2 minutes: Severe

LD_{50} (Oral-Mouse) 2400 mg/kg: Tumorigenic: active as anti-cancer agent

TDLo (Skin-Mouse) 600 mg/kg/3 days-intermittent: Blood: other changes Blood: other changes

DNA Inhibition (Human Fibroblast) 20 mmol/L

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

IRRITANCY OF PRODUCT: This product may cause moderate to severe irritation or burns to the eyes. Depending on concentration or duration of exposure, inhalation and skin contact may cause moderate to severe irritation.

SENSITIZATION TO THE PRODUCT: The Maleic Acid component is considered a human skin sensitizer. Due to the presence of Ascorbic Acid ingestion of this product may result in UV sensitization.

SYNERGISTIC MATERIALS: None known.

REPRODUCTIVE TOXICITY INFORMATION: Components have no known human mutagenic, embryotoxic, teratogenic or reproductive toxicity effects; the following animal data are available.

Mutagenicity: The components of this product are not reported to cause human mutagenic effects. In tests involving the Maleic Acid component positive results were obtained in cultured human cells. Negative results were obtained in tests using bacteria.

Embryotoxicity/Teratogenicity/ Reproductive Toxicity: No animal data available that may be relevant to human exposure.

ACGIH BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, ACGIH Biological Exposure Indices (BEIs) have not been determined for this material.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

MOBILITY IN SOILS: This product has not been tested for mobility in soil. It is not expected to be mobile. The following information is available for the Maleic Acid component.

MALEIC ACID: Maleic Acid is extremely soluble in water (788 g/L) and therefore would not adsorb appreciably to soil.

PERSISTENCE AND BIODEGRADABILITY: This product has not been tested for persistence or biodegradability; it is anticipated to fully biodegradation. The following information is available for the Maleic Acid component.

MALEIC ACID: If released on land, maleic acid will leach into the ground and probably biodegrade. If released into water, Maleic Acid will also probably biodegrade. Adsorption to sediment, bioconcentration in aquatic organisms, and volatilization should not be significant. It will be primarily associated with aerosols in the atmosphere and be subject to gravitational settling and degradation by reaction with ozone and photochemically produced hydroxyl radicals (vapor phase half-life 1.1 hour). Maleic Acid is a solid that melts at 130°C and is extremely soluble in water (788 g/L). Therefore, volatilization from water should not be a significant transport process

12. ECOLOGICAL INFORMATION (Continued)

BIO-ACCUMULATION POTENTIAL: This product is not expected to have bio-accumulation potential. The following information is available for the Maleic Acid component.

MALEIC ACID: The BCF of Maleic Acid in fish (golden Ide) was < 10 after 3 days of exposure while that in algae (*Chorella fusca*) was 11 after 24 hours. The BCF calculated from the water solubility (788 g/L) using a recommended regression equation is 3, which indicates the bioconcentration should not be an important process.

ECOTOXICITY: This product has not been tested for aquatic organism toxicity. The following aquatic toxicity data are available for the Maleic Acid component.

MALEIC ACID:

TLm (Mosquito fish) 24-48 hours = 240 ppm/Conditions of bioassay not specified

TLm (Fathead minnow) 96 hours = 5 ppm /Conditions of bioassay not specified

OTHER ADVERSE EFFECTS: Components of this product are not listed or expected to have having ozone depletion potential.

RESULTS OF PBT and vPvB ASSESSMENT: No data available. PBT and vPvB assessments are part of the chemical safety report required for some substances in European Union Regulation (EC) 1907/2006, Article 14.

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

13. DISPOSAL CONSIDERATIONS

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

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

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

EPA WASTE NUMBER: Wastes of this product should be tested to see if they meet the criteria of Waste Characteristic D002 (Corrosivity).

EUROPEAN WASTE CODES: 16 05 08: Discarded Organic Chemicals Consisting of or Containing Dangerous Substances.

14. TRANSPORTATION INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION REGULATIONS: This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This product is not classified as dangerous goods, per the International Air Transport Association.

INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO): This product is not classified as dangerous goods, per the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is not classified by the Economic Commission for Europe to be dangerous goods.

TRANSPORT IN BULK ACCORDING TO THE IBC CODE: Not applicable.

ENVIRONMENTAL HAZARDS: This material does not meet the criteria of environmentally hazardous according to the criteria of the UN Model Regulations (as reflected in the IMDG Code, ADR, RID, and ADN) and is not specifically listed in Annex III under MARPOL 73/78.

15. REGULATORY INFORMATION

UNITED STATES REGULATIONS:

U.S. SARA Reporting Requirements: This material is not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA Section 302 Threshold Planning Quantity (TPQ): None.

U.S. SARA Section 304 Reportable Quantity (TPQ): None

U.S. CERCLA Reportable Quantity (RQ): None.

U.S. TSCA Inventory Status: This compound is listed on the TSCA Inventory.

Other U.S. Federal Regulations: Not applicable.

The Maleic Acid component 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.

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65): This material is not listed on the California Proposition 65 lists.

15. REGULATORY INFORMATION (Continued)

CANADIAN REGULATIONS:

Canadian DSL/NDSL Status: This material is listed on the DSL inventory.

Canadian Environmental Protection Agency (CEPA) Priorities Substances List: Not applicable.

Canadian WHMIS Classification and Symbols: Class D2B (Poisonous and infectious material - Other Effects – Acute Toxicity, Irritation, Sensitization Effects)

EUROPEAN REGULATIONS:

Safety, Health, and Environmental Regulations/Legislation Specific for the Product: Currently, there is no specific legislation pertaining to this product.

Chemical Safety Assessment: No data available. The chemical safety assessment is required for some substances according to European Union Regulation (EC) 1907/2006, Article 14.

16. OTHER INFORMATION

U.S. ANSI STANDARD LABELING (Precautionary Statements): WARNING! HARMFUL IF SWALLOWED. CAUSES SEVERE EYE IRRITATION OR BURNS (IF IN SOLUTIONS). MAY CAUSE RESPIRATORY IRRITATION IF INHALED. MAY CAUSE SKIN IRRITATION. PROLONGED OR REPEATED SKIN CONTACT MAY CAUSE DERMATITIS. MAY CAUSE SKIN SENSITIZATION. Avoid breathing dusts or particulates. Avoid contact with skin, eyes, or clothing. Wash after handling. Do not taste or swallow. Wear gloves, goggles, and appropriate body protection. **FIRST-AID:** In case of contact with skin or eyes, flush skin with plenty of water. If inhaled, remove to fresh air. If swallowed, induce vomiting. Get medical attention if adverse effects develop. **IN CASE OF FIRE:** Use water fog, dry chemical, CO_2, or "alcohol" foam. **IN CASE OF SPILL:** Sweep-up or vacuum spilled solid. Consult Safety Data Sheet for additional information.

GLOBAL HARMONIZATION AND EU CLP REGULATION (EC) 1272/2208 LABELING AND CLASSIFICATION: This product has been classified per GHS Standards under European regulations.

Classification: Acute Toxicity Oral Category 3, Skin Irritation Category 2, Eye Irritant Category 2A, Specific Target Organ Toxicity (Inhalation-Respiratory Irritation) Single Exposure Category 3

Hazard Statements: H302: harmful if swallowed. H315: Causes skin irritation. H319: Causes serious eye irritation. H335: May cause respiratory irritation. , Skin Sensitisation Category 1

Signal Word: Warning.

Precautionary Statements:

Prevention: P261: Avoid breathing dust. P264: Wash thoroughly after handling. P270: Do not eat, drink or smoke when using this product. P271: Use only outdoors or in a well-ventilated area. P272: Contaminated work clothing should not be allowed out of the workplace. P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response: P301 + P312: If swallowed, Call a POISON CENTER or doctor/physician if you feel unwell. P330: Rinse mouth. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P333 + P313: If skin irritation or rash occurs, get medical attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337 + P313: If eye irritation persists: get medical advice/attention. P304 + P340: If inhaled, remove victim to fresh air and keep at rest in a position comfortable for breathing. P312: Call a POISON CENTER or doctor if you feel unwell. P321: Specific treatment (remove from exposure and treat symptoms). Refer to other portions of precautionary text on this label, SDS or other product information sheets, as appropriate.

Storage: P403 + P233: Store in a well-ventilated place. Keep container tightly closed.

Disposal: P501: Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard Symbols/Pictograms: GHS07

EU 67/548/EEC LABELING AND CLASSIFICATION: This product is classified as per European Union Council Directive 67/548/EEC or subsequent Directives.

Classification: Harmful, Irritant

Risk Phrases: R22: Harmful if swallowed. R36/37/38: Irritating to eyes, respiratory system and skin. R43: May cause sensitisation by skin contact.

Safety Phrases: S S24: Avoid contact with skin. S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28: After contact with skin, wash immediately with plenty of water. 36/37/39: Wear suitable protective clothing, gloves and eye/face protection. S45: In case of accident or if you feel unwell seek medical advice immediately (show the label where possible). S46: If swallowed, seek medical advice immediately and show this container or label.

EU Hazard Symbols: Xi/N

REVISIONS DETAILS: April 2015: Up-date entire SDS to include GHS and EU CLP compliance.

REFERENCES AND DATA SOURCES: Contact the supplier for information.

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

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