CHEMETALL FOOTE CORPORATION
MATERIAL SAFETY DATA SHEET

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

CHEMETALL FOOTE CORPORATION
348 HOLIDAY INN DRIVE
KINGS MOUNTAIN, NC 28086
704-739-2501 (8 AM–5 PM M–F)

FOR EMERGENCY TRANSPORTATION INFORMATION, CALL CHEMTREC
1-800-424-9300

SUBSTANCE: LITHIUM CARBONATE

TRADE NAMES/SYNONYMS: Carbonic Acid, Dilithium Salt; Dilithium Carbonate; Carbonic Acid, Lithium Salt; Lithium Carbonate (Li_2CO_3)

CHEMICAL FAMILY: Inorganic Salt
FORMULA: Li_2CO_3

CREATION DATE: 05/08/95 REVISION DATE: 03/10/04 (see Section 16 for revision details)

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

Component	CAS #	% w/w	Exposure Limits in Air				
			ACGIH-TLVs		OSHA-PELs		OTHER
			TWA mg/m³	STEL mg/m³	TWA mg/m³	STEL mg/m³	mg/m³
Lithium Carbonate (exposure limits are for Particulates Not Otherwise Classified)	554-13-2	> 99	NE	NE	15 (Total dust) 5 (Respirable fraction)	NE	DFG MAKs: TWA = 4 (inhalable fraction), 1.5 (respirable fraction)

NE = Not Established See Section 16 for Definition of other terms and acronyms used.
NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1998 format.

SECTION 3 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Lithium Carbonate is a white, odorless powder. Lithium Carbonate may moderately to severely irritate contaminated skin and eyes. Lithium Carbonate is neither flammable nor reactive. Emergency responders must wear personal protective equipment suitable for the situations to which they are responding.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most serious health consequences reported for Lithium Carbonate have been adverse effects on the central nervous system, heart, and thyroid from chronic overexposure through ingestion (during medical treatments). In terms of anticipated occupational overexposure situations for employees, the main health effect from overexposure would be irritation of contaminated skin and eyes.

INHALATION: Inhalation of airborne dusts may irritate the nose, throat, and other tissues of the respiratory system. Symptoms of such overexposure include burning sensation, coughing, wheezing, shortness of breath, and headache. Severe inhalation overexposure may be fatal.

CONTACT WITH SKIN or EYES: Lithium Carbonate is a moderate to severe skin and eye irritant. Skin contact can cause itching, pain, and redness. Prolonged or repeated skin exposures can lead to dermatitis (dry, red skin). Depending on the duration and concentration of overexposure, eye contact can cause pain, tearing, and redness.

SKIN ABSORPTION: Skin absorption is not a significant route of exposure for Lithium Carbonate.

INGESTION: Ingestion is not anticipated to be a significant route of occupational exposure. Acute or chronic ingestion of Lithium Carbonate may cause rash, ringing in the ears, nausea, vomiting, diarrhea, difficulty speaking, drowsiness, twitching, visual disturbances, and coma. Chronic ingestion of Lithium Carbonate may adversely affect the central nervous system, heart, and thyroid. Severe ingestion overexposure may be fatal.

INJECTION: Injection of Lithium Carbonate (via puncture with a contaminated object) can cause pain and irritation in addition to the wound; symptoms such as those described for "Ingestion" may develop.

SECTION 3 HAZARDS IDENTIFICATION (Continued)

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**.

ACUTE: In terms of occupational use situations, the chief health effect anticipated after overexposure would be moderate to severe irritation of contaminated skin and eyes. Severe inhalation and ingestion overexposure may be fatal.

CHRONIC: Prolonged or repeated skin exposures can lead to dermatitis (dry, red skin). Chronic ingestion of Lithium Carbonate may cause rash, ringing in the ears, nausea, vomiting, diarrhea, difficulty speaking, drowsiness, twitching, visual disturbances, and coma. Chronic ingestion of Lithium Carbonate may adversely affect the central nervous system, heart, and thyroid. Lithium Carbonate is a reproductive toxin. Refer to Section 11 (Toxicological Information) for additional information.

TARGET ORGANS: ACUTE: Eyes, skin.: CHRONIC: Central nervous system, heart, thyroid.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM RATING: Health Hazard = 2; Fire Hazard = 0; Physical Hazard = 0; (see Section 16, Other Information).

SECTION 4 FIRST-AID MEASURES

Victims of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention if necessary. Take copy of label and MSDS to physician or health professional with victim. Refer below to "Recommendations to Physicians" for specific information for physicians on treatment of poisoning of this product.

SKIN EXPOSURE: If Lithium Carbonate contaminates the skin, immediately begin decontamination with running water. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victims must seek immediate medical attention if adverse effect occurs.

EYE EXPOSURE: If Lithium Carbonate contaminates 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. Victims must seek immediate medical attention if any adverse effect occurs.

INHALATION: If Lithium Carbonate is inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Obtain medical attention if adverse effect occurs.

INGESTION: If Lithium Carbonate is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. DO NOT INDUCE VOMITING, unless directed by medical personnel. If conscious, have victim rinse mouth with water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory, skin, central nervous system, and kidney conditions can be aggravated by overexposure to Lithium Carbonate. Persons with significant cardiovascular or renal disease, sodium and water imbalance, and pre-existing hypothyroidism may also be at increased risk. Alertness may be impaired.

RECOMMENDATIONS TO PHYSICIANS: Detailed toxicology information related to lithium salts, such as Lithium Carbonate, is presented in the following sections. This information is intended to give physicians background information in the event of ingestion overexposures to Lithium Carbonate.

LITHIUM SALTS:

ACUTE EXPOSURE: Ingestion of a large dose of lithium salts may cause severe gastroenteritis and may effect the central nervous system, renal function, and fluid and electrolyte balance. Symptoms, possibly delayed, may include nausea, vomiting, thirst, anorexia, diarrhea, blurred vision, drowsiness, weakness, tremor, staggering, bradycardia, and coma. More unusual reactions may include delirium with EEG changes, action myoclonus, rhabdomyolysis, ECG changes, glycosuria, and allergic erythema. A painful discoloration of the fingers and toes and coldness of the extremities within 1 day of therapeutic use has been reported. In severe cases, death may occur due to renal failure or cardiac or pulmonary complications. Some survivors may have long-lasting or permanent sequelae, mostly of cerebellar nature but sometimes with peripheral neuropathy or parkinsonism.

CHRONIC EXPOSURE: Repeated or prolonged ingestion of lithium salts may cause symptoms as detailed for acute ingestion. In addition, a metallic taste, dry mouth, excessive thirst, abdominal pain, and incontinence of urine and feces may occur. Nervous system effects may include a dazed feeling, confusion, giddiness, mental lapses, dyspraxia, drowsiness, vertigo, headache, apathy, restlessness, anxiety, some suppression of the REM phases of sleep, positive Romberg sign, blackout spells, stupor, tinnitus, unconsciousness, and coma. Neurologic asymmetry, psychomotor retardation, slurred speech, nystagmus, changes in the EEG and epileptiform seizures may occur. Pseudotumor cerebri (increased intracranial pressure and papilledema) has been reported and may possibly result in enlargement of the blind spot, constriction of visual fields, and eventual blindness due to optic atrophy. Photophobia has been reported. Muscular effects may include tremors, ataxia, muscular and reflex hyperirritability with fasiculations, twitching and spastic or choreo-athetotic movements, cogwheel rigidity, parkinsonism, and dystonia. Two cases involving severe generalized sensorimotor peripheral neuropathy have been reported. ECG changes, cardiac arrhythmias, hypotension, peripheral circulatory collapse, and interstitial myocarditis are possible. Leukocytosis is fairly common. Endocrine effects may include disturbed iodine metabolism, stimulation of antithyroidal auto-antibodies, hypothyroidism with myxedema, or hyperthyroidism. Osteoporosis, an increase in serum total calcium, ionized calcium, and parathyroid hormone and independently functioning parathyroid adenomas have been reported. Transitory nephrotic syndrome and acquired nephrogenic diabetes insipidus may occur. Transient hyperglycemia, lowered urinary concentrating ability leading to hypernatremia and hyperosmolality, sodium depletion, polyuria, glycosuria, oliguria, anuria, and azotemia are possible. Morphologic changes with glomerular and interstitial fibrosis and nephron atrophy have been reported; however, a causal relationship has not been established.

SECTION 4 FIRST-AID MEASURES (Continued)

RECOMMENDATIONS TO PHYSICIANS (continued):

CHRONIC EXPOSURE (continued): Dermatologic effects may include cutaneous hyperalgesia or anesthesia, xerosis cutis, chronic folliculitis, generalized pruritus with or without rash, development or exacerbation of acne or psoriasis, cutaneous ulcers, and alopecia. Hyper- or hypothermia, weight gain, edema of the ankles and wrists, and sexual dysfunction have been reported. Death may occur due to renal failure, brain damage, or pulmonary complications. Lithium readily crosses the placental barrier and is excreted in breast milk. The use of lithium during pregnancy has been associated with neonatal goiter, cardiac anomalies (especially ebstein's), central nervous system depression, and hypotonia. Marked functional and structural changes in the kidneys of newborn rats exposed to lithium via their mother's milk have been reported. Adverse effects on nidation in rats and embryo viability in mice have been attributed to lithium, as have teratogenicity in submammalian species and cleft palates in mice; however, studies in rats, rabbits, and monkeys have shown no evidence of lithium-induced developmental defects. Leukemia has been reported during lithium treatment; however, an epidemiologic study involving a population of 173,000 persons yielded negative results.

NOTE TO PHYSICIAN:

ANTIDOTE: The following antidote has been recommended; however, the decision as to whether the severity of poisoning requires administration of any antidote and actual dose required should be made by qualified medical personnel.

LITHIUM/LITHIUM SALT POISONING: 1) In single ingestion episodes, give syrup of ipecac and/or perform gastric lavage if productive vomiting has not already occurred. 2) Fluid and electrolyte replacement for the correction of dehydration and acid-base imbalances. Overhydration may precipitate pulmonary edema. 3) Infusion of urea or mannitol, alkalinization of the urine, and aminophylline increase lithium excretion in patients with good renal function. 4) Extracorporeal or peritoneal hemodialysis to decrease lithium levels and control uremia in severe intoxications. If a massive overdose is known with certainty to have been ingested, it may be prudent to institute these measures even in the absence of positive clinical findings because of severe delayed toxicity. 5) Diazepam for the suppression of abnormal motor activity. 6) Support treatment for central nervous system depression. 7) Frequent electrocardiograms to assess cardiac status. (Gosselin, Smith, Hodge-Clinical Toxicology of Commercial Products, Fifth Edition).

NOTE: Activated charcoal does not bind lithium effectively and is not useful in isolated lithium toxicity. (Groleau, Lithium Toxicity, Emergency Medicine Clinics of North America, Volume 12, Number 2, May, 1994). Raising the sodium intake does not increase lithium clearance. (Thomsen, K.

SECTION 5 FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume): Not applicable

FIRE EXTINGUISHING MATERIALS: Lithium Carbonate is not flammable. Use fire extinguishing material appropriate for surrounding fires.

Water Spray: YES Carbon Dioxide: YES Foam: YES

Dry Chemical: YES Halon: YES Other: Any "ABC" Class

UNUSUAL FIRE AND EXPLOSION HAZARDS: This material presents a moderate contact hazard to firefighters. When involved in a fire, this material may decompose and produce irritating fumes and toxic gases (e.g., lithium compounds, carbon oxides).

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. If possible, firefighters should control runoff water to prevent environmental contamination.

NFPA RATING: Health Hazard = 2; Fire Hazard = 0; Instability Hazard = 0; (see Section 16, Other Information).

SECTION 6 ACCIDENTAL RELEASE MEASURES

Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area and protect people.

The minimum Personal Protective Equipment recommended for response to non-incidental releases should be Level C: triple-gloves (rubber gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard-hat, and air-purifying respirator with high-efficiency particulate filter. Self-Contained Breathing Apparatus would be worn in situations where the oxygen level is below 19.5 % or is unknown. Sweep up or vacuum spilled Lithium Carbonate carefully, avoiding the generation of airborne dusts. Decontaminate the area thoroughly. Place all spill residue in a suitable container and seal. Dispose of in accordance with U.S. Federal, State, and local or Canadian solid waste disposal regulations (see Section 13, Disposal Considerations).

SECTION 7 HANDLING AND STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Lithium Carbonate ON YOU or IN YOU. Wash thoroughly after handling Lithium Carbonate. Avoid creating airborne dusts or particulates of Lithium Carbonate. Clean work areas periodically to avoid generation of dusts. Do not eat or drink while handling Lithium Carbonate. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Use in a well-ventilated location. Open containers slowly on a stable surface. Containers of Lithium Carbonate must be properly labeled. Empty containers may contain residual amounts of Lithium Carbonate; therefore, empty containers should be handled with care.

Storage area of Lithium Carbonate should be clearly identified, well illuminated, clear of obstruction, and accessible only to trained and authorized personnel. Store containers in a cool, dry location, away from direct sunlight, or sources of intense heat. 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). Keep container tightly closed when not in use. Storage areas should be made of fire resistant materials. Post warning signs in storage and use areas, as appropriate. Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely, as applicable. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

The information presented is based only on lithium carbonate. The Exposure Controls and Personal Protection required will be dependent on the conditions present in the workplace, including the presence of other chemicals. PPE should be based on a Hazard Assessment as required in 29CFR1910.132.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation, to ensure exposures are below limits provided in Section 2 (Composition and Information on Ingredients). Mechanical exhaust may be needed. Where there is any possibility that an employee's eyes may be exposed to Lithium Carbonate, the employer should provide an eye wash fountain within the immediate work area for emergency use.

RESPIRATORY PROTECTION: Respiratory protection is not generally needed when using Lithium Carbonate. Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, 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 is required under OSHA's Respiratory Protection Standard (1910.134-1998).

EYE PROTECTION: Splash goggles or safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133, and appropriate Canadian Standards.

HAND PROTECTION: Wear neoprene gloves for routine industrial use. If necessary, refer to U.S. OSHA 29 CFR 1910.138 and appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate for task (e.g., Apron or Tyvek suit). 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, wear foot protection, as described in U.S. OSHA 29 CFR 1910.136.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): Not applicable.	EVAPORATION RATE : Not applicable.
SPECIFIC GRAVITY (water = 1): 2.1	MELTING/FREEZING POINT: 723°C (1333°F)
SOLUBILITY IN WATER @ 20°C: 1.3 g/ 100 mL	BOILING POINT: 1310°C (2390°F) decomposes
VAPOR PRESSURE, mm Hg @ 20°C: 0	pH: 11.2 (1% solution)

ODOR THRESHOLD: Not applicable.

COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not established.

APPEARANCE AND COLOR: White, odorless solid.

HOW TO DETECT THIS SUBSTANCE (warning properties): Lithium Carbonate does not have any unique warning properties.

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition of Lithium Carbonate can generate lithium and carbon oxides.

SECTION 10 STABILITY AND REACTIVITY (Continued)

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Lithium Carbonate is not compatible with strong acids, strong oxidizers, and fluorine.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Mixing Lithium Carbonate with incompatible chemicals.

SECTION 11 TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicology data available for Lithium Carbonate as follows:

TDLo (Oral-Woman) 36,500 mg/kg/10 years-intermittent: Kidney, Ureter, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis); Kidney, Ureter, Bladder: urine volume increased; Endocrine: diabetes insipidus (nephrogenic or CNS)

TDLo (Oral-Woman) 612 mg/kg/44 days-intermittent: Behavioral: sleep; Skin and Appendages: dermatitis, allergic (after systemic exposure)

TDLo (Oral-Woman) 8760 mg/kg/2 years-intermittent: Endocrine: thyroid weight (goiter); Endocrine: evidence of thyroid hyperfunction

TDLo (Oral-Woman) 120 mg/kg/days-intermittent: Behavioral: excitement

TDLo (Oral-Man) 25 gm/kg/4 years-intermittent: Behavioral: tremor; Sense Organs and Special Senses (Eye): miosis (pupillary constriction)

TDLo (Oral-Man) 8 mg/kg: Gastrointestinal: nausea or vomiting; Skin and Appendages: dermatitis, other (after systemic exposure)

TDLo (Oral-Human) 4111 mg/kg: Behavioral: tremor, muscle weakness; Gastrointestinal: other changes

TDLo (Oral-Man) 54 mg/kg: Behavioral: sleep, hallucinations, distorted perceptions

TDLo (Oral-Man) 1080 mg/kg/13 weeks-intermittent: Skin and Appendages: dermatitis, allergic (after systemic exposure)

TDLo (Unreported-Woman) 556 mg/kg/32 days: Behavioral: toxic psychosis

LD_{50} (Oral-Rat) 525 mg/kg: Behavioral: somnolence (general depressed activity); Lungs, Thorax, or Respiration: respiratory depression; Gastrointestinal: hypermotility, diarrhea

LD_{50} (Oral-Mouse) 531 mg/kg

LD_{50} (Oral-Dog) 500 mg/kg

LD_{50} (Intraperitoneal-Rat) 156 mg/kg: Behavioral: somnolence (general depressed activity); Lungs, Thorax, or Respiration: respiratory depression; Gastrointestinal: hypermotility, diarrhea

LD_{50} (Intraperitoneal-Mouse) 236 mg/kg: Behavioral: altered sleep time (including change in righting reflex), excitement, ataxia

LD_{50} (Subcutaneous-Rat) 434 mg/kg: Sense Organs and Special Senses (Eye): lacrimation; Lungs, Thorax, or Respiration: respiratory depression; Skin and Appendages: hair

LD_{50} (Subcutaneous-Mouse) 413 mg/kg

LD_{50} (Intravenous-Rat) 241 mg/kg: Behavioral: altered sleep time (including change in righting reflex); Lungs, Thorax, or Respiration: respiratory depression

LD_{50} (Intravenous-Mouse) 497 mg/kg: Behavioral: altered sleep time (including change in righting reflex); Lungs, Thorax, or Respiration: respiratory depression

TD (Oral-Woman) 21 gm/kg/3.5 years-continuous: Tumorigenic Carcinogenic by RTECS criteria; Endocrine: thyroid tumors

TD (Oral-Woman) 5940 mg/kg/47 weeks-continuous: Tumorigenic: Carcinogenic by RTECS criteria; Blood: leukemia

TD (Oral-Man) 6132 mg/kg/2 years-continuous: Tumorigenic: Carcinogenic by RTECS criteria; Blood: leukemia

TDLo (Oral-Rat) 4500 mg/kg/30 days-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain, dehydration; Related to Chronic Data: death

TDLo (Oral-Rat) 18,200 mg/kg/26 weeks-intermittent: Endocrine: changes in adrenal weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain, weight loss or decreased weight gain

TDLo (Oral-Rat) 36,400 mg/kg/52 weeks-intermittent: Cardiac: changes in heart weight; Gastrointestinal: other changes; Related to Chronic Data: death

TDLo (Oral-Woman) 3600 mg/kg/21 weeks-intermittent: Tumorigenic: Carcinogenic by RTECS criteria; Blood: leukemia

TDLo (Oral-Woman) 3072 mg/kg: female 1-37 week(s) after conception: Reproductive: Effects on Newborn: other neonatal measures or effects

TDLo (Oral-Woman) 4900 mg/kg: female 1-35 week(s) after conception: Reproductive: Specific Developmental Abnormalities: cardiovascular (circulatory) system

TDLo (Oral-Woman) 4256 mg/kg: female 1-38 week(s) after conception: Reproductive: Effects on Newborn: Apgar score (human only), other neonatal measures or effects

TDLo (Oral-Woman) 10,080 mg/kg: female 26 week(s) pre-mating: 34 week(s) after conception: Reproductive: Effects on Newborn: stillbirth

TDLo (Intraperitoneal-Rat) 600 mg/kg/60 days-intermittent: Kidney, Ureter, Bladder: changes in tubules (including acute renal failure, acute tubular necrosis)

TDLo (Oral-Species Unspecified) 14,560 µg/kg/26 weeks-intermittent: Brain and Coverings: recordings from specific areas of CNS; Liver: liver function tests impaired; Blood: pigmented or nucleated red blood cells

TDLo (Unreported-Human-woman) 540 mg/kg: female 35-39 week(s) after conception: Reproductive: Effects on Newborn: other neonatal measures or effects

TDLo (Unreported-Human-woman) 556 mg/kg: female 30-34 week(s) after conception: Reproductive: Effects on Newborn: other neonatal measures or effects

TDLo (Unreported-Human-woman) 11,520 mg/kg: female 7 week(s) pre-mating female 1-38 week(s) after conception: Reproductive: Specific Developmental Abnormalities: Central Nervous System, musculoskeletal system, gastrointestinal system

TDLo (Unreported-Human-woman) 11,520 mg/kg: female 7 week(s) pre-mating female 1-38 week(s) after conception: Reproductive: Effects on Newborn: Apgar score (human only), other neonatal measures or effects

TDLo (Oral-Rat) 600 mg/kg: female 9-14 day(s) after conception: Reproductive: Specific Developmental Abnormalities: musculoskeletal system

TDLo (Oral-Rat) 1 gm/kg: female 6-15 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Effects on Embryo or Fetus:fetotoxicity (except death, e.g., stunted fetus); Specific Developmental Abnormalities: musculoskeletal system

TDLo (Oral-Rat) 1050 mg/kg: female 1-21 day(s) after conception: Reproductive: Fertility: litter size (e.g. # fetuses per litter; measured before birth); Effects on Newborn: growth statistics (e.g.%, reduced weight gain)

TDLo (Oral-Rat) 1050 mg/kg: lactating female 21 day(s) post-birth: Reproductive: Effects on Newborn: growth statistics (e.g.%, reduced weight gain)

TDLo (Oral-Mouse) 4650 mg/kg: female 6-15 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetal death, Specific Developmental Abnormalities: craniofacial (including nose and tongue)

TDLo (Oral-Mouse) 4650 mg/kg: female 6-15 day(s) after conception: Reproductive: Specific Developmental Abnormalities: craniofacial (including nose and tongue); Fertility: litter size (e.g. # fetuses per litter; measured before birth)

TDLo (Oral-Mouse) 2 gm/kg: female 8-12 day(s) after conception: Reproductive: Effects on Newborn: live birth index (measured after birth)

SECTION 11 TOXICOLOGICAL INFORMATION (Continued)

TOXICITY DATA (continued):

TDLo (Oral-Mouse) 600 mg/kg: female 7-12 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetal death, sex ratio

TDLo (Intraperitoneal-Mouse) 42 mg/kg: male 60 day(s) pre-mating: Reproductive: Fertility: male fertility index (e.g. # males impregnating females per # males exposed to fertile non-pregnant females)

TDLo (Intraperitoneal-Mouse) 40 mg/kg: female 8 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants)

TDLo (Intraperitoneal-Mouse) 200 mg/kg: female 8 day(s) after conception: Reproductive: Specific Developmental Abnormalities: Central Nervous System

TDLo (Intraperitoneal-Mouse) 200 mg/kg: female 9 day(s) after conception: Reproductive: Specific Developmental Abnormalities:musculoskeletal system

TDLo (Intraperitoneal-Mouse) 300 mg/kg: female 8 day(s) after conception: Reproductive: Specific Developmental Abnormalities: Central Nervous System, craniofacial (including nose and tongue)

TDLo (Unreported-Mouse) 4650 mg/kg: female 6-15 day(s) after conception: Reproductive: Specific Developmental Abnormalities: craniofacial (including nose and tongue)

TDLo (Oral-Pig) 240 gm/kg: female 36-115 day(s) after conception: Reproductive: Effects on Newborn: stillbirth, live birth index (measured after birth), weaning or lactation index (e.g., # alive at weaning per # alive at day 4)

TDLo (Oral-Pig) 240 gm/kg: female 36-115 day(s) after conception: Reproductive: Effects on Newborn: other neonatal measures or effects978

DNA Damage (Human-Fibroblast) 500 mg/L

DNA Inhibition (Human-Fibroblast) 2 gm/L

DNA Inhibition (Oral-Rat) 420 gm/kg/12 weeks-continuous

Cytogenetic Analysis (Unreported-Human) 12,800 µg/kg/12 weeks-intermittent

Cytogenetic Analysis (Oral-Mouse) 1200 µg/kg/days-intermittent

Sister Chromatid Exchange (Oral-Mouse) 1200 µg/kg/3 days-intermittent

Mutation in Mammalian Somatic Cells (Hamster-Lung) 2 gm/L

CARCINOGENICITY STATUS: Lithium Carbonate is not found on the following lists: IARC, FEDERAL OSHA Z LIST, NTP, and CAL/OSHA and therefore is neither considered to be nor suspected to be a cancer causing agent by these agencies.

IRRITANCY OF PRODUCT: Lithium Carbonate is expected to moderately to severely irritate the skin and eyes.

SENSITIZATION TO THE PRODUCT: Lithium Carbonate is not known to be a human skin or respiratory sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: Lithium Carbonate is used as a medication for manic-depression. Overexposures to Lithium Carbonate may cause reproductive disorders. Lithium Carbonate may cause fetal harm when administered to a pregnant woman. Children of mothers who received Lithium Carbonate during the first three months of pregnancy have reported in some, but not all, studies to have a slightly increased frequency of malformations of the heart and blood vessels. Even though this risk is low and uncertain, it is strongly recommended that women discontinue lithium therapy during the first three months of pregnancy. Additionally, lithium is excreted in human milk. Nursing should not be undertaken during lithium therapy except in rare and unusual circumstances.

NOTE! It is important for pregnant women not to be exposed above the exposure limits defined in Section 2 (Composition and Information on Ingredients) during the first trimester, due to the reported teratogenicity of Lithium Carbonate.

Mutagenicity: Human mutation data are available for Lithium Carbonate; these data were obtained during clinical studies on specific human tissues exposed to high doses of this compound.

Embryotoxicity: Lithium Carbonate is not reported to produce embryotoxic effects in humans.

Teratogenicity: Lithium Carbonate is reported to produce teratogenic effects in humans. Clinical studies on test animals exposed to relatively high doses of Lithium Carbonate provided teratogenic data.

Reproductive Toxicity: Lithium Carbonate is not reported to produce adverse reproductive effects in humans. Clinical studies on test animals exposed to relatively high doses of Lithium Carbonate provided reproductive toxicity data.

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

ACGIH BIOLOGICAL EXPOSURE INDICES (BEIs): Currently there are no ACGIH Biological Exposure Indices (BEIs) determined for Lithium Carbonate.

SECTION 12 ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: Lithium Carbonate is stable in the environment.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: The effects on exposed animals would be primarily irritation of contaminated tissue. The main effect on plants would be the increase in salinity of contaminated soils if large volumes of Lithium Carbonate are released.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Releases of large quantities of Lithium Carbonate can be detrimental to an aquatic environment, by altering the salinity of a body of water.

SECTION 12 ECOLOGICAL INFORMATION (Continued)

ACUTE AQUATIC TOXICITY: No data available.

DEGRADABILITY: No data available.

LOG BIOCONCENTRATION FACTOR (BCF): No data available.

LOG OCTANOL/WATER PARTITION COEFFICIENT: No data available.

SECTION 13 DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations or with regulations of Canada and its Provinces. Lithium Carbonate, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local solid waste regulatory authority.

U.S. EPA WASTE NUMBER: Not applicable to wastes consisting only of Lithium Carbonate.

SECTION 14 TRANSPORT INFORMATION

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

PROPER SHIPPING NAME:	Not Regulated
HAZARD CLASS NUMBER and DESCRIPTION:	Not Applicable
UN IDENTIFICATION NUMBER:	Not Applicable
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Not Applicable

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

MARINE POLLUTANT: Lithium Carbonate is not designated as a Marine Pollutant by the DOT (per 49 CFR 172.101, Appendix B).

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

EMERGENCY RESPONSE CONTACT FOR AN INCIDENT DURING TRANSPORTATION:
CHEMTREC 1-800-424-9300 or 1-703-527-3887

SECTION 15 REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: Lithium Carbonate is not subject to the reporting requirements of the Comprehensive Environmental Response, Compensation, and Liability Act and Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

CERCLA SECTION 103 (40 CFR 302.4) Listed CERCLA Extremely Hazardous Substance:	No
SARA SECTION 302 (40 CFR 355.30) Extremely Hazardous Substance:	No
SARA SECTION 304 (40 CFR 355.40) RQ-CERCLA or SARA 302:	No
SARA SECTION 313 (40 CFR 372.65) Toxic Chemical Release Inventory (TRI/Form R):	Yes

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this compound. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,544 kg) may apply, per 40 CFR 370.20.

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

U.S. TSCA INVENTORY STATUS: Lithium Carbonate is listed on the TSCA Inventory.

U.S. TSCA 12b EXPORT NOTIFICATION: TSCA 12(b) Notification is not required, per 40 CFR 707, for Lithium Carbonate.

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

SECTION 15 REGULATORY INFORMATION (Continued)

U.S. STATE REGULATORY INFORMATION: Lithium Carbonate is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: No.
California - Permissible Exposure Limits for Chemical Contaminants: No.
Florida - Substance List: No.
Illinois - Toxic Substance List: No.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: No.
Michigan - Critical Materials Register: Lithium Compounds.
Minnesota - List of Hazardous Substances: No.
Missouri - Employer Information/Toxic Substance List: No.
New Jersey - Right to Know Hazardous Substance List: Lithium Carbonate.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: No.
Rhode Island - Hazardous Substance List: No.
Texas - Hazardous Substance List: No.
West Virginia - Hazardous Substance List: No.
Wisconsin - Toxic and Hazardous Substances: No.

CALIFORNIA PROPOSITION 65: Lithium Carbonate is on the California Proposition 65 lists. WARNING! Lithium Carbonate is chemical known to the State of California to cause birth defects or other reproductive harm.

ANSI STANDARD LABELING (Precautionary Statements): **WARNING!** CAUSES SKIN AND EYE IRRITATION. MAY BE HARMFUL IF SWALLOWED. CAN CAUSE CENTRAL NERVOUS SYSTEM EFFECTS AND KIDNEY DAMAGE. SUSPECTED REPRODUCTIVE TOXIN. Avoid contact with skin, eyes, and clothing. Wash thoroughly after handling. Use in well-ventilated area. Wear gloves, goggles and appropriate body protection. FIRST-AID: In case of skin or eye contact, flush with water for 15 minutes. Remove contaminated clothing and shoes. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If ingested, do not induce vomiting. Seek medical attention if adverse effects. IN CASE OF FIRE: Use water fog, dry chemical, CO_2, or "alcohol" foam. IN CASE OF SPILL: Sweep up or vacuum spilled material. Place in a suitable container. Consult Material Safety Data Sheet before use.

WARNING! Lithium Carbonate is chemical known to the State of California to cause birth defects or other reproductive harm.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: Lithium Carbonate is on the DSL Inventory.

CANADIAN WHMIS SYMBOLS: **Class D2A** Other Toxic Effects-Teratogenicity and Embryotoxicity; (see final page of this document).

SECTION 16 OTHER INFORMATION

REVISIONS MADE IN 2004:
Section 16: Up-date of Standard Labeling

The information in this Material Safety Data Sheet is based on data that Chemetall Foote Corporation believes to be reliable as of the MSDSs date of revision. Chemetall Foote Corporation makes no warranty or representation of any kind that the MSDS does not contain errors. The data in this MSDS relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process. It is intended for use by persons having technical skill and at their own discretion and risk. Since conditions of use are outside the control of Chemetall Foote Corporation, there are no warranties, expressed or implied, and Chemetall Foote Corporation assumes no liability in connection with the use of this information. Nothing herein is to be taken as a license to operate under or a recommendation to infringe on any patents. Any use of these data and information must be determined by the user to be in accordance with Federal, State and local laws and regulations.

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
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619/670-0609

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

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association that establishes exposure limits. **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 Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.

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

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

SECTION 16 OTHER INFORMATION (Continued)

DEFINITIONS OF TERMS (continued):

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS

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 LD_{50} Rat*: < 5000 mg/kg. *Dermal Toxicity LD_{50}Rat or Rabbit*: < 2000 mg/kg. *Inhalation Toxicity 4-hrs LC_{50} 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 LD_{50} Rat*: > 500-5000 mg/kg. *Dermal Toxicity LD_{50}Rat or Rabbit*: > 1000-2000 mg/kg. *Inhalation Toxicity LC_{50}* 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 LD_{50} Rat*: > 50-500 mg/kg. *Dermal Toxicity LD_{50}Rat or Rabbit*: > 200-1000 mg/kg. *Inhalation Toxicity LC_{50} 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 LD_{50} Rat*: > 1-50 mg/kg. *Dermal Toxicity LD_{50}Rat or Rabbit*: > 20-200 mg/kg. *Inhalation Toxicity LC_{50} 4-hrs Rat*: > 0.05-0.5 mg/L.); **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 LD_{50} Rat*: ≤ 1 mg/kg. *Dermal Toxicity LD_{50}Rat or Rabbit*: ≤ 20 mg/kg. *Inhalation Toxicity LC_{50} 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.); **2** (*Water Reactivity*: Materials that may react violently with water. *Organic Peroxides*: Materials that, in themselves, are normally unstable and will readily undergo violent chemical change, but will not detonate. These materials may also react violently with water. *Explosives*: Division 1.4 – Explosive substances where the explosive effect are largely confined to the package and no projection of fragments of appreciable size or range are expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package. *Compressed Gases*: Pressurized and meet OSHA definition but < 514.7 psi absolute at 21.1°C (70°F) [500 psig]. *Pyrophorics*: No Rating. *Oxidizers*: Packing Group II Solids: any material that, either in concentration tested, exhibits a mean burning time of less than or equal to the mean burning time of a 2:3 potassium bromate/cellulose mixture and the criteria for Packing Group I are not met. Liquids: any material that exhibits a mean pressure rise time less than or equal to the pressure rise of a 1:1 aqueous sodium chlorate solution (40%)/cellulose mixture and the criteria for Packing Group I are not met. *Unstable Reactives*: Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure, but have a low potential for significant heat generation or explosion. Substances that readily form peroxides upon exposure to air or oxygen at room temperature); **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.

SECTION 16 OTHER INFORMATION (Continued)

DEFINITIONS OF TERMS (continued):

PHYSICAL HAZARD (continued):

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.). PPE Rating B: Hand and eye protection is required for routine chemical use. PPE Rating C: Hand, eye, and body protection may be required for routine chemical use.

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS:

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

FLAMMABILITY HAZARD: **0** Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand. **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 **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. **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. **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.

INSTABILITY HAZARD: **0** Materials that in themselves are normally stable, even under fire conditions. **1** Materials that in themselves are normally stable, but that can become unstable at elevated temperatures and pressures. **2** Materials that readily undergo violent chemical change at elevated temperatures and pressures. **3** 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. **4** Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction 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:

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

ECOLOGICAL INFORMATION:

EC is the effect concentration in water. **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:

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

GRAPHICAL REPRESENTATION OF HAZARDS

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM RATING

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH	(BLUE)	2
FLAMMABILITY	(RED)	0
PHYSICAL HAZARD	(YELLOW)	0

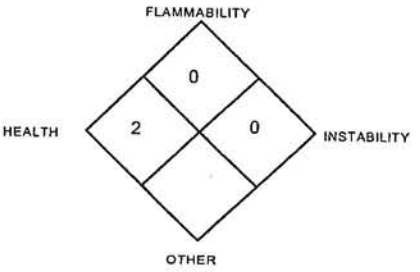
PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY

SEE SECTION 8

For Routine Industrial Applications

NATIONAL FIRE PROTECTION SYSTEM RATING



WHMIS SYMBOL

Class D2A: Materials Causing Other Toxic Effects

See Section 16 for Definition of Ratings

CHEMETALL FOOTE CORPORATION
Silver Peak Operations, Hwy 265
P.O. Box 98
Silver Peak, NV 89047

(775) 937-2222 Phone
(775) 937-2250 Fax

CERTIFICATE of ANALYSIS
LITHIUM CARBONATE
LI2CO3 FINE POWDER

LOT NUMBER: 312-C09

LOG NUMBER: 03-C461

CHEMICAL ANALYSIS	RESULTS (%)	SPECIFICATIONS
Li2CO3	99.2	MIN 99.0
SO4	0.17	MAX 0.30
H2O	0.06	
Na	0.093	
K	0.025	
Cl	0.021	
Ca	0.045	
Mg	0.003	
B	0.04	
Fe2O3	< 0.001	MAX 0.004
Acid Insol	0.007	
LOI	0.64	
SIEVE ANALYSIS		
+100	0.5	
+150	0.7	
+200	1.2	
-200	97.6	MIN 90.0

Chemetall Foote Corp., Silver Peak Operations verifies that:
This lot meets the minimum requirements for SP01003 REV3

Q.A. Analyst

2-19-04
Date

FOR SHIPPING USE ONLY
CUSTOMER:
CUSTOMER NO:
CUSTOMER CODE:
CFC ORDER #: