Canada Colors and Chemicals Limited

152 Kennedy Road South
Brampton, Ontario
Canada
L6W 3G4

General Inquiry Number: (905) 459-1232

Material Safety Data Sheet
Attached
1 Identification

Name: Glutathione

Synonyms: Glutathiol; L-γ-glutamylcysteineyl-glycine; 5-L-Glutamyl-L-cysteinylglycine; Copre; Deltathione; G-3980; Agifutol S; GSH; GTT;Ledac; Neuthion; Panaron; T

athion

Chemical Name: (2S)-2-Amino-5-[(2R)-1-(carboxymethylamino)-1-oxo-3-sulfanylpropan-2-yl]amino]-5-oxopentanoic acid

Formula: C_{10}H_{17}N_{3}O_{6}S

Usage: Antioxidant

2 Hazards Identification

GHS Emergency Overview

No Pictogram

Signal Words: WARNING

Hazard Category: Category 5

Hazardous Statements: MAY BE HARMFUL IF SWALLOWED

H Statements: H303: May be harmful if swallowed.

H341: Suspected of causing genetic defects.

P Statements: P201: Obtain special instructions before use.

P202: Do not handle until all safety precautions have been read and understood.

P281: Use personal protective equipment as required.

P308+P313: IF exposed or concerned: Get medical advice/attention.

P312: Call a POISON CENTER/ doctor/ physician if you feel unwell.

P405: Store locked up.

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

3 Composition/ Information on Ingredients

<table>
<thead>
<tr>
<th>Substance</th>
<th>CAS</th>
<th>EINECS</th>
<th>RTECS</th>
<th>W.t.%</th>
<th>Exposure Limits (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glutathione</td>
<td>70-18-8</td>
<td>200-725-4</td>
<td>MC0556000</td>
<td>≥ 98.0</td>
<td>ACGIH NE</td>
</tr>
</tbody>
</table>

NA: Not Available; NE: Not Established

4 First-aid Measures
Routes of Entry: Inhalation, ingestion, eyes/skin contact

Eyes: Call a physician. Assure adequate flushing by separating the eyelids with fingers. Flush with copious amounts of water for at least 15 minutes.

Skin: Flush with copious amounts of water and soap for at least 15 minutes. Remove contaminated clothing and shoes.

Inhalation: Remove to fresh air. If breathing becomes difficult, call a physician.

Ingestion: Call a physician. Wash out mouth with water and administer fresh water provided person is conscious.

Medical Attention: Remove from exposure. Remove contaminated clothing. For treatment advice, seek guidance from an occupational health physician or other licensed health-care provider familiar with workplace chemical exposures. If person is not breathing, give artificial respiration. If breathing is difficult, give oxygen if available. Persons developing serious hypersensitivity (anaphylactic) reactions must receive immediate medical attention.

5 Fire-fighting Measures

Flash point: 410.102°C

Auto-Ignition Temperature: NAIF

UEL (%): NAIF

LEL (%): NAIF

Suitable Extinguishing Media: Water spray. Carbon dioxide, dry chemical powder or appropriate foam.

Unusual Fire/Explosion Hazards: This material is assumed to be combustible. As with all dry powders it is advisable to ground mechanical equipment in contact with dry material to dissipate the potential buildup of static electricity.

Special Protective Actions for Fire-Fighters: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Hazardous Combustion Products: CO₂, NO₂, SO₂

*Data from ChemSpider; NAIF: No Available Information Found

6 Accidental Release Measures

Spills/Leaks/Releases

For Non-emergency Personnel: Immediately contact emergency personnel. Keep unnecessary personnel away.

For Emergency Responders: Wear approved respiratory protection, chemically compatible gloves and protective clothing. Wipe up spillage or collect spillage using a high efficiency vacuum cleaner. Avoid breathing dust.

Environmental Precautions: Do not let product enter drains.

Containment/Cleaning up: Place spillage in appropriately labelled container for disposal. Wash spill site.

7 Handling and Storage

Handling: Avoid inhalation. Avoid contact with eyes, skin and clothing. Avoid prolonged or repeated exposure.

Storage: Keep unopened in the original container. Keep tightly closed. Store at room temperature (Below 25 °C).

8 Exposure Controls/Personal Protection

Respiratory Protection: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Eye Protection: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
### Ventilation:
Airborne exposure should be controlled primarily by engineering controls such as general dilution ventilation, local exhaust ventilation, or process enclosure. Local exhaust ventilation is generally preferred to general exhaust because it can control the contaminant at its source, preventing dispersion into the work area. An industrial hygiene survey involving air monitoring may be used to determine the effectiveness of engineering controls. Effectiveness of engineering controls intended for use with highly potent materials should be assessed by use of nontoxic surrogate materials.

### Hand Protection:
Compatible chemical-resistant gloves (e.g. PVC, neoprene, rubber).

### Protective Clothing:
Wear appropriate protective clothing to prevent skin exposure.

### 9 Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>White or almost white crystalline powder.</td>
</tr>
<tr>
<td>Solubility</td>
<td>Freely soluble in water; Very slightly soluble in ethanol (96%) and methylene chloride.</td>
</tr>
<tr>
<td>Odor</td>
<td>NAIF</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>307.3</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>182-192°C</td>
</tr>
<tr>
<td>Specific Gravity/Density</td>
<td>1.441 g/cm³</td>
</tr>
<tr>
<td>UV_max (water)</td>
<td>210 nm</td>
</tr>
<tr>
<td>Water Solubility</td>
<td>Freely soluble</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>NAIF</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>185°C</td>
</tr>
</tbody>
</table>

*Data from ChemSpider*

### 10 Stability and Reactivity

- **Chemical Stability:** Stable under normal temperatures and pressures.
- **Conditions to Avoid:** Decomposes in hot water.
- **Incompatibility Materials:** Strong oxidizing agents.
- **Hazardous Decomposition:** COₓ, NOₓ, SOₓ.
- **Hazardous Polymerization:** Will not occur.

### 11 Toxicological Information

- **Most Important Symptoms:** Redness, nausea, vomiting, diarrhea, et. al.
- **Acute Effects:** May cause eye/skin irritation. May cause erythema (redness) and edema (fluid buildup) with crusting and scaling. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause respiratory tract irritation.
- **Delayed Effects:** Possible hypersensitization. May cause reproductive and fetal effects.
- **Pregnancy Risk Category:** C
- **Pregnancy Comments:** Glutathione may not be safe for pregnant women. Even though glutathione is produced naturally in the human body, it does not automatically mean that it is safe for use during pregnancy. Because there is very little information available regarding glutathione and pregnancy, it is probably a good idea to avoid glutathione supplements if you are pregnant or thinking about becoming pregnant.
- **Breastfeeding:** Before taking glutathione, women who are breastfeeding should consult their healthcare provider about the benefits and possible risks. There has not been any research done on glutathione and breastfeeding, so it is not known if glutathione could cause any problems in a nursing infant. However, due to the potential risks, it is probably a good idea for women to avoid glutathione supplements while breastfeeding (unless their healthcare provider specifically recommends them for a medical reason).
- **Medical Conditions Aggravated by Exposure:** Hypersensitivity to material.
### Toxicity Data Single Exposure

<table>
<thead>
<tr>
<th>Route</th>
<th>Animal</th>
<th>LD$_{50}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>p.o.</td>
<td>Mice</td>
<td>5 g/kg</td>
</tr>
<tr>
<td>i.p.</td>
<td>Mice</td>
<td>&gt; 2 g/kg</td>
</tr>
<tr>
<td>i.v.</td>
<td>Mice</td>
<td>2238 mg/kg</td>
</tr>
<tr>
<td>i.v.</td>
<td>Rabbits</td>
<td>2238 mg/kg</td>
</tr>
<tr>
<td>s.c.</td>
<td>Mice</td>
<td>4020 mg/kg</td>
</tr>
<tr>
<td>s.c.</td>
<td>Rabbits</td>
<td>&gt; 2 g/kg</td>
</tr>
<tr>
<td>i.m.</td>
<td>Mice</td>
<td>5000 mg/kg</td>
</tr>
<tr>
<td>i.m.</td>
<td>Rabbits</td>
<td>5000 mg/kg</td>
</tr>
</tbody>
</table>

**Skin:** NAIF

**Inhalation:** NAIF

**Eyes:** NAIF

### Toxicity Data Repeat Exposure

#### Target Organs:
- Liver

#### Carcinogenicity:

<table>
<thead>
<tr>
<th>NTP</th>
<th>IARC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Listed</td>
<td>Not Listed</td>
</tr>
</tbody>
</table>

#### Reproductive Toxicity:
- Rats: TD$_{LO}$ = 1250 mg/kg, 1-22 days after conception. Reproductive - Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).

#### Developmental Toxicity:
- NAIF

#### Mutagenicity:
- TA92/TA97/TA104/TA100/TA102
- TA1535/TA1537
- Mouse lymphoma Ames
- Human: Positive
- Human lymphocytes: No conclusion; Sister-chromatid exchange (SCE) in vitro.
- Microorganism
- Human Fibroblast
- Human Fibroblast
- Rats Liver
- Hamster Lung
- Hamster Ovary
- 500 ppm, Phage inhibition capacity.
- 1 mmol/L, Unscheduled DNA synthesis.
- 1 mmol/L, DNA inhibition.
- 1 mmol/L, Cytogenetic analysis.
- 1 mmol/L, Sister chromatid exchange.
- 1 mmol/L, Cytogenetic analysis.
- 100 umol/L, Sister chromatid exchange.

#### Teratogenicity:
- NAIF

#### Sensitization:
- NAIF

### References:
1. Glatt,h; mutagenicity spectra in salmonella typhimurium strains of glutathione, l-cysteine and active oxygen species; mutagenesis 4(3):221-227, 1989;
2. Seifried,he, seifried,rm, clarke,ji, junghans,tb, san, rhc; a compilation of two decades of mutagenicity test results with the Ames salmonella typhimurium and l5178y mouse lymphoma cell mutation assays. Chem. Res. Toxicol. 19: 627-644, 2006;
3. EMICBACK/60024; mutat res 156:117-121,1985;

### 12 Ecological Information

#### Bioaccumulation:
- No potential for bioaccumulation
- BCF: 3.162$	ext{^2}$$^2$
- t$_{1/2}$ = 2.03 hr in air
- t$_{1/2}$ = 360 hr in water
- t$_{1/2}$ = 720 hr in soil
- t$_{1/2}$ = 3.24$	imes$10$^3$ hr in sediment.
Mobility in Soil: Persistence Time: 579 hr
Koc= 64.24; Log Koc =1.808.
Henry's Law constant = 4.87×10^{-23} atm-m³/mole*(Volatilization from Water)

Surface Tension: 69.36 dyne/cm

BOD₅: NAIF
COD: NAIF

Ecotoxicity Effects:
Natural Pollution Sources: The product itself and its products of degradation are not toxic.

LC₅₀ (Fish-96h): ChV = 3818.105 mg/L **
EC₅₀ (Daphnies-48h): LC₅₀ = 12151.266 mg/L **; ChV = 77872.125 mg/L **
IC₅₀ (Algae-72h): EC₅₀ = 4625.401 mg/L **(Green Algae); ChV = 568.836 mg/L **

* Data from ChemSpider; ** Estimated by ECOSAR V1.10

13 Disposal Considerations
Waste Disposal:
Dispose of waste in accordance with all applicable Federal, State and local laws.

14 Transport Information
UN Number: Not Regulated
ICAO/IATA (Air):

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>Hazard Label</th>
<th>Hazard Class</th>
<th>Packing Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Regulated</td>
<td>No Placard</td>
<td>Considered</td>
<td>non-hazardous for transport</td>
</tr>
</tbody>
</table>

IMDG/IMO (Sea):

<table>
<thead>
<tr>
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<th>Hazard Label</th>
<th>Hazard Class</th>
<th>Packing Group</th>
</tr>
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<tbody>
<tr>
<td>Not Regulated</td>
<td>No Placard</td>
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</tbody>
</table>

Marine Pollutant: Not Listed

ADR (E.U.)/RID/ADN (E.U.) (road/railway/inland waterway):

<table>
<thead>
<tr>
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DOT (U.S.):

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</thead>
<tbody>
<tr>
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<td>No Placard</td>
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</table>

TDG (Canada):

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<thead>
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<tr>
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<td>No Placard</td>
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</tr>
</tbody>
</table>

ERG (Emergency Response Guide Number): Not Controlled
WHMIS Hazard Class: D2A

15 Regulatory Information
U.S.

TSCA: Listed
SARA:
SARA 302: Not Listed
SARA 304: Not Listed
SARA 313: Not Listed
SARA 110: Not Listed
CMR: Not Listed
California: P65: Not Listed
EU:
CLP: GHS08

Muta. 2, Wng, H341
P201, P202, P281, P308+P313, P405, P501

Canada:

DSL/NDSL: Listed on DSL
Australia:

AICS: Listed
P. R. China:

IECSC: Listed
SFDA:
Narcotic: Not Listed
Psychotropic: Not Listed
Germany:

WGK: Group 2

16 Other information

This information was prepared on July 10, 2009 and last updated on July 19, 2012 by Hisun EHS Lab.

This version was amended according to Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Third/Forth revised edition, United Nations, New York and Geneva, 2011.

This MSDS has been revised in the following sections: Section 2 (Hazards Identification), Section 5 (Fire-fighting Measures), Section 7 (Storage), Section 11 (Breastfeeding), Section 11 (Mutagenicity), Section 12 (Ecological Information), Section 15 (CLP).

Abbreviations and Acronyms:

ACGIH: American Conference of Industrial Hygienists
ADR: The European Agreement concerning the International Carriage of Dangerous Goods by Road
ADN: The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
AICS: The Australian Inventory of Chemical Substances
BCF: Bioconcentration Factor
BOD₅: Bio-chemical oxygen demand determined at 5 day
CMR: Carcinogenic, mutagenic and reprotoxic
COD: Chemical oxygen demand determined
DOT: Department of Transportation
DSL/NDSL: Domestic/Non-Domestic Substance List
EINECS: European Inventory of Existing Commercial Chemical Substances
IARC: International Agency for Research on Cancer
IATA: International Air Transport Association
ICAO: International Civil Aviation Organization
IECSC: Inventory of Existing Chemical Substance in China
IMDG: International Maritime Dangerous Goods
IMO: International Maritime Organization
NIOSH: The National Institute for Occupational Safety and Health
NOEC: No observed effect concentration
NTTP: National Toxicology Program
OSHA: The United States Occupational Safety and Health Administration
RID: The Regulations concerning the International Carriage of Dangerous Goods by Rail [Annex 1 to Appendix B (Uniform Rules concerning the Contract for International Carriage of Goods by Rail) (CIM) of COTIF (Convention concerning international carriage by rail)], as amended
SARA: The Superfund Amendments and Reauthorization Act
SFDA: State Food and Drug Administration, P.R.China
TDG: Transportation of Dangerous Goods
TSCA: The Toxic Substances Control Act
WHMIS: The Workplace Hazardous Materials Information System
WGK: Wassergefährdungsklassen, the German water hazard classes

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End of Safety Data Sheet