Material Safety Data Sheet

Material Name: Citric Acid, Monohydrate

*** Section 1 - Chemical Product and Company Identification ***

Part Number: BP80, BP88, BP92, USP, FCC, Technical
Chemical Name: Citric Acid, Monohydrate
Product Use: For Manufacturing Use
Synonyms: 1,2,3-Propanetricarboxylic acid, 2-hydroxy-; 2-Hydroxy-1,2,3-propanetricarboxylic acid; Propane-1,2,3-tricarboxylic acid, 2-hydroxy-; beta-hydroxytricarballylic acid.

Supplier Information
Chem One Ltd.  
8017 Pinemont Drive, Suite 100  
Houston, Texas  77040-6519  
Phone #: (713) 896-9966  
Fax #: (713) 896-7540  
Emergency #: (800) 424-9300 or (703) 527-3887

General Comments: FOR COMMERCIAL USE ONLY; NOT TO BE USED AS A PESTICIDE.

NOTE: Emergency telephone numbers are to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure, or accident involving chemicals. All non-emergency questions should be directed to customer service.

*** Section 2 - Composition / Information on Ingredients ***

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Component</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>5949-29-1</td>
<td>Citric Acid Monohydrate</td>
<td>99.5%</td>
</tr>
</tbody>
</table>

Component Related Regulatory Information
This product may be regulated, have exposure limits or other information identified as the following:
Citric Acid Anhydrous (77-92-9)

Component Information/Information on Non-Hazardous Components
This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).

*** Section 3 - Hazards Identification ***

Emergency Overview
Product is a white or colorless crystalline solid. Irritating to eyes, skin, and respiratory tract. Slight fire potential when heated. Combustible in liquid form. Use methods suitable for surrounding fire. Firefighters should wear full protective equipment when fighting a fire involving this product.

Hazard Statements
WARNING! PRODUCT CAUSES EYE, SKIN, AND RESPIRATORY TRACT IRRITATION MAY CAUSE ALLERGIC SKIN SENSITIZATION REACTION. Do not breath mists or dusts. Do not allow contact with eyes, skin, or clothing. Keep container closed. Avoid generation of dusts, which can result in a dust explosion. Use only with adequate ventilation. Wash thoroughly after handling.

Potential Health Effects: Eyes
Dusts and solution may cause severe irritation to the eyes, with symptoms that include redness, tearing, and pain. Concentrated solutions may be corrosive to the eyes and cause corneal ulcerations.

Potential Health Effects: Skin
This product may cause moderate irritation of the skin. Citric acid may cause allergic contact dermatitis with prolonged or repeated contact.

Potential Health Effects: Ingestion
Citric acid may cause mild gastrointestinal irritation, with symptoms including nausea, diarrhea, vomiting, abdominal pain. Concentrated solutions may cause necrotic and ulcerative lesions on oral mucous membranes.

Potential Health Effects: Inhalation
Dusts and mists from solutions may cause mild to moderate irritation of the nose and throat. Overexposure could cause coughing, sneezing, and labored breathing.

HMIS Ratings: Health Hazard: 2* Fire Hazard: 0 Physical Hazard: 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe  * = Chronic hazard

*** Section 4 - First Aid Measures ***

First Aid: Eyes
Immediately flush eyes with large amounts of room temperature water, occasionally lifting the lower and upper lids, for at least 15 minutes. If symptoms persist after 15 minutes of irrigation, seek medical attention.
Material Safety Data Sheet

Material Name: Citric Acid, Monohydrate

* * * Section 4 - First Aid Measures (Continued) * * *

First Aid: Skin
Remove all contaminated clothing. For skin contact, wash thoroughly with soap and water for at least 20 minutes. Seek immediate medical attention if irritation develops or persists.

First Aid: Ingestion
DO NOT INDUCE VOMITING, unless directed by medical personnel. Have victim rinse mouth thoroughly with water, if conscious. Never give anything by mouth to a victim who is unconscious or having convulsions. Contact a physician or poison control center immediately.

First Aid: Inhalation
Remove source of contamination or move victim to fresh air. Apply artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Get immediate medical attention.

First Aid: Notes to Physician
There is no specific antidote. Care is symptomatic and supportive.

* * * Section 5 - Fire Fighting Measures * * *

Flash Point: Not available.
Method Used: Not applicable.
Upper Flammable Limit (UFL): 2.29 kg/m3
Lower Flammable Limit (LFL): 0.28-2.3 kg/m3 (dust)
Auto Ignition: 1010 deg. C
Flammability Classification: Not applicable.
Rate of Burning: Not applicable.

General Fire Hazards
Slight fire potential when heated. Citric Acid poses a serious dust explosion hazard.

Hazardous Combustion Products
Carbon dioxide and carbon monoxide are normal products of combustion. Incomplete combustion may produce irritating fumes and acrid smoke.

Extinguishing Media
Water, foam, dry chemical, or carbon dioxide.

Fire Fighting Equipment/Instructions
Firefighters should wear full protective clothing including self contained breathing apparatus.

NFPA Ratings: Health: 2 Fire: 0 Reactivity: 0 Other:
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

* * * Section 6 - Accidental Release Measures * * *

Containment Procedures
Stop the flow of material, if this can be done without risk. Contain the discharged material. If sweeping of a contaminated area is necessary use a dust suppressant agent, which does not react with product (see Section 10 for incompatibility information).

Clean-Up Procedures
Prevent material from entering sewers or waterways. Put material in suitable, covered, labeled containers.

Evacuation Procedures
Evacuate the area promptly and keep upwind of the spilled material. Isolate the spill area to prevent people from entering. Keep materials which burn away from spilled material. In case of large spills, follow all facility emergency response procedures.

Special Procedures
Wear adequate personal protective equipment. Avoid inhalation of dusts. Ventilate the area.

* * * Section 7 - Handling and Storage * * *

Handling Procedures
Avoid generation of dusts and mists. Use this product only with adequate ventilation. Do not breathe dusts or mists. Do not allow dusts or mists of this material to contact your eyes or skin. Wash thoroughly after handling.

Storage Procedures
Keep the container tightly closed and in a cool, well-ventilated place. Store away from heat and metal nitrates.
**Section 8 - Exposure Controls / Personal Protection**

**Exposure Guidelines**

**A: General Product Information**

No exposure guidelines have been established.

**B: Component Exposure Limits**

ACGIH, OSHA, and NIOSH have not developed exposure limits for any of this product's components.

The exposure limits given are for Particulates Not Otherwise Classified (PNOC).

- **OSHA**: 15 mg/m³ TWA (Total dust)
- **DFG MAKs**: 4 mg/m³ TWA (Inhalable fraction)
- **DFG MAKs**: 1.5 mg/m³ TWA (Respirable fraction)

**Engineering Controls**

Use general ventilation and use local exhaust, where possible, in confined or enclosed spaces.

**PERSONAL 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). Please reference applicable regulations and standards for relevant details.

**Personal Protective Equipment: Eyes/Face**

Wear safety glasses with side shields or chemical goggles. If necessary, refer to U.S. OSHA 29 CFR 1910.133.

**Personal Protective Equipment: Skin**

Use impervious gloves. Butyl rubber, natural rubber, neoprene, nitrile rubber, polyethylene, or PVC are recommended. If necessary, refer to U.S. OSHA 29 CFR 1910.138.

**Personal Protective Equipment: Respiratory**

None required where adequate ventilation conditions exist. If airborne concentration is high, use an appropriate respirator or dust mask. 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. 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).

**Personal Protective Equipment: General**

Wash hands thoroughly after handling material. Do not eat, drink, or smoke in work areas. Have a safety shower and eye-wash fountain available.

**Section 9 - Physical & Chemical Properties**

**Physical Properties: Additional Information**

The data provided in this section are to be used for product safety handling purposes. Please refer to Product Data Sheets, Certificates of Conformity or Certificates of Analysis for chemical and physical data for determinations of quality and for formulation purposes.

- **Appearance**: Colorless powder.
- **Odor**: None.
- **Physical State**: Solid.
- **pH**: 2.3 (1% solution)
- **Vapor Pressure**: < 0.1 mbar at 20 deg. C
- **Vapor Density**: Not applicable.
- **Boiling Point**: Not applicable.
- **Freezing/Melting Point**: 140-153 deg. C
- **Solubility (H2O)**: 59.2 g/100 ml water at 20 deg. C
- **Specific Gravity**: 1.542
- **Percent Volatile**: Not available
- **Particle Size**: powder or crystals
- **Softening Point**: Not applicable.
- **Evaporation Rate**: Not applicable.
- **Viscosity**: Not applicable.
- **Bulk Density**: 900-980 kg/m³
- **Chemical Formula**: C6H8O7 * H2O
- **Molecular Weight**: 210.14

**Section 10 - Chemical Stability & Reactivity Information**

**Chemical Stability**

Stable under normal conditions. Dilute aqueous solutions of Citric Acid may ferment if left standing for long period of time.

**Chemical Stability: Conditions to Avoid**

Heat, moisture and incompatible materials.
Section 10 - Chemical Stability & Reactivity Information (Continued)

Hazardous Decomposition
Carbon dioxide and carbon monoxide are normal products of combustion. Incomplete combustion may produce irritating fumes and acrid smoke.

Incompatibility
Potentially explosive reaction with metal nitrates, strong bases, and oxidizers. Citric Acid is incompatible with reducing agents. Citric Acid when wet or in solution is corrosive to brass, copper, zinc, aluminum and their alloys, lead, cast iron and steel (not stainless steel).

Hazardous Polymerization
Hazardous polymerization will not occur.

Section 11 - Toxicological Information

Acute and Chronic Toxicity
A: General Product Information
Citric acid has been reported to have allergenic properties, and might cause allergic contact dermatitis. Irritation of the skin, eyes, and gastrointestinal tract may occur, but should not require extensive therapy beyond dilution/irrigation. Dusts and solution may cause severe irritation to the eyes, with symptoms that include redness, tearing, and pain. Concentrated solutions may be corrosive to the eyes and cause corneal ulcerations. This product may cause moderate irritation of the skin. Citric acid may cause mild gastrointestinal irritation, with symptoms including nausea, diarrhea, vomiting, abdominal pain. Concentrated solutions may cause necrotic and ulcerative lesions on oral mucous membranes. Dusts and mists from solutions may cause mild to moderate irritation to the nose and throat. Increased concentrations could cause coughing, sneezing, and labored breathing.

B: Component Analysis - LD50/LC50
Citric Acid (77-92-9)
Oral LD50 Rat: 3 gm/kg; Oral LD50 Mouse: 5040 mg/kg

Carcinogenicity
A: General Product Information
No information identified.

B: Component Carcinogenicity
None of this product's components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

Epidemiology
No information available.

Neurotoxicity
Has not been identified.

Mutagenicity
Citric acid would not be expected to be genotoxic at physiological concentrations because it is a normal metabolite. It was not mutagenic in Salmonella typhimurium, and did not induce chromosome aberrations in cultured Chinese hamster fibroblast cells.

Teratogenicity
Citric acid did not cause reproductive effects when tested in experimental animals. The sodium salt did not cause birth defects in rats. When given to rats at 1.2% in the diet over 2 generations, it did not affect reproduction. It did not affect litter size or survival of mice with prenatal exposure to up to 5% in the diet.

Other Toxicological Information
Persons with pre-existing eye, skin, respiratory, or allergic conditions may be more sensitive.

Section 12 - Ecological Information

Ecotoxicity
A: General Product Information
No additional information.

B: Ecotoxicity
No ecotoxicity data are available for this product's components.

Environmental Fate
Citric acid is a naturally occurring chemical and is biodegradable. Octanol/Water Partition Coefficient Log P (oct): -1.72
**Section 13 - Disposal Considerations**

**US EPA Waste Number & Descriptions**

A: General Product Information
Concentrated solutions may be considered DOO2 wastes (corrosive) by RCRA. Wastes should be tested prior to disposal to determine classification.

B: Component Waste Numbers
No EPA Waste Numbers are applicable for this product's components.

**Disposal Instructions**
Review federal, provincial, and local government requirements prior to disposal. Disposal by controlled incineration or secure landfill may be acceptable.

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**Section 14 - Transportation Information**

**NOTE:** The shipping classification information in this section (Section 14) is meant as a guide to the overall classification of the product. However, transportation classifications may be subject to change with changes in package size. Consult shipper requirements under I.M.O., I.C.A.O. (I.A.T.A.) and 49 CFR to assure regulatory compliance.

**US DOT Information**
- **Shipping Name:** Non-regulated.
- **Hazard Class:** Not Applicable
- **UN/NA #:** Not Applicable
- **Packing Group:** Not Applicable
- **Required Label(s):** None
- **Additional Info.:** None.

**International Air Transport Association (IATA)**
For Shipments by Air transport: We classify this product as hazardous (Class 9) when shipped by air because 49 CFR 173.140 (a). “For the purposes of this subchapter, miscellaneous hazardous material (Class 9) means a material which presents a hazard during transportation, but which does not meet the definition of any other hazard class. This class includes: (a) Any material which has an anesthetic, noxious, or other similar property which could cause extreme annoyance or discomfort to a flight crew member so as to prevent the correct performance of assigned duties.”
- **UN:** UN 3077
- **Proper Shipping Name:** Environmentally hazardous substance, solid, n.o.s. (citric acid)
- **Hazard Class:** 9
- **Packing Group:** III
- **Passenger & Cargo Aircraft Packing Instruction:** 911
- **Passenger & Cargo Aircraft Maximum Net Quantity:** 400 kg
- **Limited Quantity Packing Instruction (Passenger & Cargo Aircraft):** Y911
- **Limited Quantity Maximum Net Quantity (Passenger & Cargo Aircraft):** 30 kg
- **Special Provisions:** A97 A149
- **ERG Code:** 9L

**International Maritime Organization (I.M.O.) Classification**
Citric Acid is not regulated under I.M.O.

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**Section 15 - Regulatory Information**

**US Federal Regulations**

A: General Product Information
Components of this product have been checked against the non-confidential TSCA inventory by CAS Registry Number. Components not identified on this non-confidential inventory are either exempt from listing (i.e. polymers, hydrates) or are listed on the confidential inventory as declared by the supplier.

B: Component Analysis
None of this product’s components are listed under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), or CERCLA (40 CFR 302.4).
C: Sara 311/312 Tier II Hazard Ratings:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS #</th>
<th>Fire Hazard</th>
<th>Reactivity Hazard</th>
<th>Pressure Hazard</th>
<th>Immediate Health Hazard</th>
<th>Chronic Health Hazard</th>
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</thead>
<tbody>
<tr>
<td>Citric Acid</td>
<td>77-92-9</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

State Regulations

A: General Product Information
Other state regulations may apply.

B: Component Analysis - State

California Proposition 65

Citric Acid is not on the California Proposition 65 chemical lists.

None of this product's components are listed on the state lists from CA, FL, MA, MN, NJ, or PA.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS #</th>
<th>CA</th>
<th>FL</th>
<th>MA</th>
<th>MN</th>
<th>NJ</th>
<th>PA</th>
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<tbody>
<tr>
<td>Citric Acid Monohydrate</td>
<td>5949-29-1</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Other Regulations

A: General Product Information

B: Component Analysis – Inventory

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS #</th>
<th>TSCA</th>
<th>DSL</th>
<th>EINECS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citric Acid Monohydrate</td>
<td>5949-29-1</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

C: Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS #</th>
<th>Minimum Concentration</th>
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</thead>
<tbody>
<tr>
<td>Citric Acid Monohydrate</td>
<td>5949-29-1</td>
<td>No disclosure limit</td>
</tr>
</tbody>
</table>

ANSI Labeling (Z129.1):

**WARNING!** CAUSES EYE, SKIN, AND RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC SKIN SENSITIZATION REACTION. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing dusts or particulates. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Keep from contact with clothing. Wear gloves, goggles, faceshields, suitable body protection, and NIOSH/MSHA-approved respiratory protection, as appropriate. **FIRST-AID:** In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention. **IN CASE OF FIRE:** Use water fog, dry chemical, CO2, or “alcohol” foam. **IN CASE OF SPILL:** Absorb spill with inert material. Place residue in suitable container. Consult Material Safety Data Sheet for additional information.
Other Information

Chem One Ltd. ("Chem One") shall not be responsible for the use of any information, product, method, or apparatus herein presented ("Information"), and you must make your own determination as to its suitability and completeness for your own use, for the protection of the environment, and for health and safety purposes. You assume the entire risk of relying on this Information. In no event shall Chem One be responsible for damages of any nature whatsoever resulting from the use of this product or products, or reliance upon this Information. By providing this Information, Chem One neither can nor intends to control the method or manner by which you use, handle, store, or transport Chem One products. If any materials are mentioned that are not Chem One products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed. Chem One makes no representations or warranties, either express or implied of merchantability, fitness for a particular purpose or of any other nature regarding this information, and nothing herein waives any of Chem One's conditions of sale. This information could include technical inaccuracies or typographical errors. Chem One may make improvements and/or changes in the product(s) and/or the program(s) described in this information at any time. If you have any questions, please contact us at Tel. 713-896-9966 or E-mail us at Safety@chemone.com

Key/Legend
NA = Not available or not applicable  g = grams; kg = kilograms  GRAS = Generally regarded as safe

Contact: Sue Palmer-Koleman, PhD  Contact Phone: (713)-896-9966

Revision log
07/24/00  4:21 PM  SEP  Changed company name, Sect 1 and 16, from Corporation to Ltd.
05/14/01  9:31 AM  HDF  Checked exposure limits; made changes to Sect 9; overall review, add SARA 311/312 Haz Ratings.
07/24/01  3:02 PM  CLJ  Add Shipments by Air information to Section 14, Changed contact to Sue, non-800 Chemtrec Num.
5/21/03: 4:30 PM  HDF  General review and up-date of entire MSDS. Up-graded Section 8 to include PNOC exposure limits. Up-date of HMIS categories. Up-date of Section 8. Up-date of Section 14.
6/22/05 12:54 PM  SEP  Update IATA Section 14.
6/07/06  7: 18 AM  HDF Addition of Proposition 65 statement in Section 15
10/17/07  4:02 PM  SEP  Update IATA Section 14

This is the end of MSDS # COC-23