Complying with 1907/2006/EEC Regulation of 18 December 2006 ("REACH Regulation") and REGULATION (EC) No 1272/2008 (CLP)

**Section 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING**

**1.1 Product identifier**
Substance Name: SUCCINIC ACID
Trade name: SUCCINIC ACID
Synonyms: Butanedioic acid
Chemical formula: C₄H₆O₄
Product type: Organic Acid
CAS number: 110-15-6
EC number: 203-740-4
REACH registration no(s):

**1.2 Relevant identified uses of the substance or mixture and uses advised against**
Intended Use: Intermediate for production of pharmaceuticals and acidulate.

Identified Uses:
- Manufacture of Substance
- Distribution of Substance
- Intermediate for Production of Pharmaceuticals
- Use in Laboratories

Uses advised against: This product is not recommended for any industrial, professional or consumer use other than the Identified Uses above.

**1.3 Details of the supplier of the safety data sheet**
Company/undertaking identification

Supplier/Manufacturer: GADIV PETROCHEMICAL INDUSTRIES Ltd.
P.O.B 32 HAIFA
Tel: +972-4-8788020
Fax: +972-4-8788018
E-mail: Gadiv@orl.co.il

E-mail address of person responsible for this SDS: gamiram@orl.co.il

**1.4 Emergency telephone number**

Emergency telephone number (including hours of operation): +972-4-8788643

**Section 2. HAZARDS IDENTIFICATION**

**2.1 Classification of the substance or mixture**
According to EC Directive 2001/59/EC Most Important Hazards:
SAFETY DATA SHEET

Substance Name: SUCCINIC ACID

Classification in accordance to Regulation (EC) No. 1272/2008 (CLP/GHS)

Physical / Chemical Hazards:
Not Classified

Health Hazards:
Eye irritation, Category 2

Environmental Hazards:
Not Classified

Classification according to Directive 67/548/EEC (DSD) or 1999/45/EC

- Xi – Irritant

R37/38: Irritating respiratory system and skin
R41: Risk of serious damage to eyes

2.2 Label elements

Labeling in accordance with Regulation 1272/2008 (CLP)

Hazard pictograms:

Signal word: Warning

Hazard statements:

H319: Causes serious eye irritation.

Precautionary Statements:

P264: Wash hands thoroughly after handling.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313: IF eyes irritation occurs: Get medical advice/attention.

2.3 Other hazards

N/A
Section 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/preparation

Formula: \( \text{C}_4\text{H}_6\text{O}_4 \)
Molecular weight: 118.09 g/mol

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>CAS number</th>
<th>EC number</th>
<th>%</th>
<th>EU Classification</th>
<th>GHS Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUCCINIC ACID</td>
<td>110-15-6</td>
<td>203-740-4</td>
<td>&gt;99.5%</td>
<td>Xi; R37/38 R41</td>
<td>Eye Irr. 2 H319</td>
</tr>
<tr>
<td>REACH registration no.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in section 8.

See section 16 for the full text of the H-statements and R-phrases declared above.

Section 4. FIRST AID MEASURES

4.1 Product-specific hazards
Causes eye irritation.

4.2 General advice
Take care to self-protect by avoiding becoming contaminated. Seek medical assistance - show the safety data sheet or label if possible.

4.3 Description of first aid measures

Inhalation: Move exposed person to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In the event of any complaints or symptoms, avoid further exposure.

Ingestion: Wash out mouth with water. Move exposed person to fresh air. Keep person warm and at rest. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
**Skin contact:**  
**Solid Material:** Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.  
**Material in Liquid State:** Wash skin immediately with plenty of water and soap. Call a physician. CONTACT WITH THE HOT MELT: Cooling immediately with plenty of water. Do not remove product crusts which may have formed neither forcibly nor by applying any solvents to the skin involved. In order to obtain medical care for possible burns and for a smooth cleansing of the skin, seek medical advice immediately.

**Eye contact:**  
**Solid Material:** Eye contact: Get medical attention immediately. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.  
**Material in Liquid State:** Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek immediate medical attention.

4.4 **Advice to physician**  
Causes eye irritation. This irritation can result in redness and swelling of the eyes.  

No specific antidote; medical staff contacts Poisons Information Center. All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

#### Section 5: FIRE-FIGHTING MEASURES

**5.1 Extinguishing media**

**Suitable extinguishing media:**  
Use an extinguishing agent suitable for the surrounding fire. Examples: water spray, water fog or foam. For small fire use dry powder or carbon dioxide (CO₂) extinguisher, dry sand or fire fighting foam.

**Unsuitable extinguishing media:**  
None are known.

**5.2 Hazardous combustion products**

Decomposition products may include the following materials: carbon oxides (carbon monoxide and carbon dioxide), smoke and soot.

**5.3 Special exposure hazards during fire fighting**

No specific fire or explosion hazard. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

**5.4 Special protective measures for firefighters**

Fire-fighters should wear appropriate protective equipment and self contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.
Other: All combustion residues and contaminated water from fire-fighting should be disposed of according to local regulations

Section 6: ACCIDENTAL RELEASE MEASURES

6.1 Prevention of secondary risk
None.

6.2 Personal precautions
No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spill material. Provide adequate ventilation. Put on appropriate personal protective equipment (see section 8).

6.3 Environmental precautions
Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
Large spill: Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.
Small spill: Move containers from spill area. Vacuum or sweep up material and place in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

6.4 Reference to other sections
See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

Section 7: HANDLING AND STORAGE

7.1 Advice on safe handling
Prevention of user exposure:
Put on appropriate personal protective equipment.
Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used.
Do not get in eyes or on skin or clothing.
Do not ingest.
Use only with adequate ventilation.
Wear appropriate respirator when ventilation is inadequate.

Prevention of fire and explosion:
Avoid contact with heat and ignition sources and with strong oxidizing agents.

Precautions while moving the product:
Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.
Empty containers retain product residue and can be hazardous.
Hygiene Measures:
Workers should wash hands and face before eating, drinking and smoking.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures:
Store in accordance with local regulations.
Store in original container protected from direct sunlight in a dry, cool and well ventilated area, away from incompatible materials (see section 10) and food and drink.
Use appropriate containment to avoid environmental contamination.

Storage precautions:
Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
Remarks: Avoid all possible sources of ignition (spark or flame).
Take precautionary measures against electrostatic discharges.
Keep container tightly closed and sealed until ready for use.
Containers that have been opened must be carefully resealed and kept upright to prevent leakage.
Do not store in unlabelled containers.

Incompatible products:
Avoid contact with strong oxidizing agents, amines and strong bases.

Packaging materials:
Recommended: Use original container.

7.3 Specific end use(s):

Section 8: EXPOSURE CONTROL / PERSONAL PROTECTION

8.1 Risk management measures

Occupational Exposure Controls:

Technical measures: Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Occupational Exposure Limits: Refer to the CSR.

Derived No Effect Level (DNEL)

<table>
<thead>
<tr>
<th>Exposure pattern</th>
<th>Route</th>
<th>Workers</th>
<th>General population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term – systemic effects</td>
<td>Oral</td>
<td>600 mg/kg bw/day</td>
<td>600 mg/kg bw/day</td>
</tr>
<tr>
<td>Long-term – systemic effects</td>
<td>Dermal</td>
<td>600 mg/kg bw/day</td>
<td>600 mg/kg bw/day</td>
</tr>
<tr>
<td>Long-term – systemic effects</td>
<td>Inhalation</td>
<td>2100 mg/m³</td>
<td>1060 mg/m³</td>
</tr>
</tbody>
</table>
8.2 Exposure controls

Engineering Controls

Recommended monitoring procedures: If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to European Standard EN 689 for methods for the assessment of exposure by inhalation to chemical agents and national guidance documents for methods for the determination of hazardous substances.

Person Protective measures

Respiratory protection: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Recommended: In case of dust formation particle filter P2.

Respiratory hazard monitoring method: This substance does not require monitoring of the concentration in the breathing zone of workers or in the general workplace.

Eye protection: Wear tightly fitting safety goggles.

Skin protection

Hand protection: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. After contamination with product change the gloves immediately and dispose of them according to relevant national and local regulations.

<1 hours (breakthrough time): use Nitrile rubber – NBR gloves.

Skin and body (other than the hands): Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Recommended: chemical-resistant protective suit.

Hygienic measures: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before re-using. Ensure that eyewash stations and safety showers are close to the workstation location.

Environmental exposure controls:

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment may be necessary to reduce emissions to acceptable levels.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

General information

Physical state: Solid
Colour: White
Odour: Not available
Molecular weight: 118.09

Safety data
pH: 2.7 (at 0.1 Molar).
Boiling point/boiling range: 235°C.
Auto-ignition temperature: >520°C.
Flash point: 206°C.
Flammability: Non flammable
Explosive properties: Non explosive
Oxidizing properties: Not oxidizing
Heat of combustion: Not available.
Vapor pressure (Pa, 20°C): Not available.
Vapor pressure (mmHg, 20°C): Not available.
Relative density: 1.57 g/cm³ at 20°C
Stability in organic solvents: Stable
Water solubility: 1 gm / 13 ml cold water.
Log partition coefficient n-Octanol / Water: Not available.
Viscosity: Solid material
Vapour density: Solid material
Evaporation rate (n-butyl acetate=1): Solid material

Other information:
Melting point / melting range: 188°C
Surface tension: solid material
Granulometry: Not available.
Dissociation constants: Not available.

Section 10: STABILITY AND REACTIVITY

10.1 Stability
The product is stable at normal storage, handling and use temperatures.

10.2 Conditions to avoid
Heat, sparks, ignition points, flames, static electricity.

10.3 Materials to avoid
Keep away from strong oxidizing agents, amines and strong alkalis.

10.4 Hazardous Decomposition products
Under normal conditions of storage and use, hazardous decomposition products should not be produced. Incomplete combustion and thermolysis produce potentially toxic gases such as: carbon monoxide, carbon dioxide and soot.

10.5 Hazard polymerization:
Will not happen.
Section 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity by oral route, inhalation and dermal route: very low acute toxicity. However, Succinic Acid is classified under Annex I of Dir 67/548/EEC as Xi, R36 – Irritating to eyes, with corresponding classification under CLP of H319 – Causes serious eye irritation.

<table>
<thead>
<tr>
<th>Product / ingredient name</th>
<th>Test</th>
<th>Species</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Succinic Acid</td>
<td>LD$<em>{50}$, Oral Discriminating dose, Inhalation LD$</em>{50}$, Intravenous</td>
<td>Rat</td>
<td>2,260 mg/kg bw</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rat</td>
<td>1,400 mg/L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mouse</td>
<td>20,000 mg/kg bw</td>
</tr>
</tbody>
</table>

Skin irritation / corrosion: Mildly irritating to the skin, however, no need for classification. No evidence of corrosivity.

Eye irritation: Irritating to eyes.

Skin sensitization: Not sensitizing.

CMR Effects:

Mutagenicity: Genetic toxicity: Negative.

Carcinogenicity: Negative. No indications of any human tumorigenic potential for succinic acid.

Reproductive toxicity: No evidence of reproductive toxicity. NOAEL: 400 mg/kg body weight / day.

Developmental toxicity: Succinic acid is not considered to be a developmental toxicant.

Repeated dose toxicity - Oral route: NOAEL: 600 mg/kg body weight/day.

Toxicokinetics: Based on the available data, Succinic acid is of low concern for toxicity and additional toxicokinetic testing is not required.

Chronic/Other Effects: No other information is available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Experimental data from reliable studies are available for acute aquatic ecotoxicity endpoints (toxicity to fish and algae). In the chemical safety assessment performed according to Article 14(3) in connection with Annex I section 3 (Environmental Hazard Assessment) no hazard was identified. Therefore according to REACH Annex I (5.0) exposure estimation is not necessary for birds, soil microorganisms, terrestrial plants and others.
### Substance name: Succinic Acid

<table>
<thead>
<tr>
<th>Substance name</th>
<th>Toxicity to fish</th>
<th>Toxicity to crustaceans</th>
<th>Toxicity to algae/terrestrial plants</th>
<th>Toxicity to other aquatic plants</th>
<th>Other data (birds, bees, plants etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Succinic Acid</td>
<td>LC₅₀ / 96H: &gt;100 mg/l <em>(Danio rerio)</em></td>
<td>EC₅₀ / 72H: &gt;100 mg/l <em>(Daphnia magna)</em></td>
<td>EC₅₀/72H: &gt;100 mg/l (based on biomass) EC₅₀/72H: &gt;100 mg/l (based on growth rate) <em>(Pseudokirchnerella subcapitate)</em></td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Activated sludge respiration inhibition testing (3hr NOEC):** > 300 mg/l

**Mobility:** Adsorption/desorption – Not expected to adsorb to soil or sediment due to the low log Kow < 3.

**Persistence and Degradability**

- **Biotic** – Succinic acid is readily biodegradable.
- **Abiotic** – Hydrolysis study does not need to be conducted as the substance is readily biodegradable.

**Degradation products:** CO₂. Identification of other degradation products – Not available.

**Bioaccumulative potential:** Succinic acid has low potential to bioaccumulate based on a log Kow of 0.46.

**Result of PBT/vPvB assessment (if CSR is required):** Succinic acid is neither a PBT nor a vPvB substance.

**Other adverse effects:**

- Substances which have an unfavorable influence on the oxygen balance and can be measured using parameters such as BOD, COD, etc.: Not available.

- Substances, which contribute to eutrophication: Not available

### Section 13: DISPOSAL CONSIDERATIONS

#### 13.1 Methods of disposal

Examine possibilities for re-utilization. Product residues and un-cleaned empty containers should be packaged, sealed, labeled, and disposed of or recycled according to relevant national and local regulations. Where large quantities are concerned, consult the supplier. When un-cleaned empty containers are passed on, the recipient must be warned of any possible hazard that may be caused by residues. For disposal within the EC, the appropriate code according to the European Waste List (EWL) should be used. It is among the tasks of the polluter to assign the waste to waste codes specific to industrial sectors and processes according to the European Waste List (EWL).

#### 13.2 Hazardous waste

The classification of the product does not meet the criteria for a hazardous waste.
Section 14: TRANSPORT INFORMATION

14.1 Land Transportation (ADR/RID) / Inland Waterway Transport (AND(R))

UN number: Not regulated as a hazardous material
Proper shipping name: SUCCINIC ACID
Hazard class: ----
Packing group: ----
ADR/RID-Labels: ----
Hazchem code: ----
Classification code: ----

14.3 Marine Transport (IMDG)

UN number: Not regulated as a hazardous material
Proper shipping name: SUCCINIC ACID
Environmental Hazard: No

14.4 Air Transport (ICAO/IATA)

UN number: Not regulated as a hazardous material
Proper shipping name: SUCCINIC ACID

National Fire Protection Association Hazard Ratings- NFPA (R):

Health Hazard - 1
Flammability - 1
Reactivity - 0

Section 15: REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
EU Directives 67/548/EEC and 1999/45/EC (including amendments) and take into account the intended product use.
EU Regulation (EC) No.1907/2006 (REACH)
EU Regulation (EC) No 1272/2008 (CLP)

15.2 Chemical safety assessment
In accordance with REACH article 14, a Chemical Safety Assessment has been carried out for this substance.

Section 16: OTHER INFORMATION

Full text of R-phrases referred to in sections 2 and 3:
R37/38 - Irritating respiratory system and skin
R41 – Risk of serious damage to eyes.
Safety phrases:
S02 - Keep out of the reach of children.
S22 - Do not breathe dust.
S24/25 - Avoid contact with skin and eyes.
S39 – Wear eye/face protection.

Full text of Hazards Statements referred to in sections 2 and 3:
H319 - Causes serious eye irritation.

Precautionary Statements:
P264 - Wash hands thoroughly after handling.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313 - IF eyes irritation occurs: Get medical advice/attention.

Training advice: Before using/handling the product one must read carefully present MSDS.

Recommended restriction: N/A

Key Legend Information:
ACGIH- American Conference of Governmental Industrial Hygienists
OSHA- Occupational Safety and Health Administration
NTP- National Toxicology program
IARC- International Agency for Research on Cancer
ND- Not Determined
N/A- Not available
R-phrases- Risk phrases
S-phrases- Safety phrases
H-statements – Hazard statements
P-statements – Precautionary statements

Version no. 1
Date of issue: 01/09/2011

To the best of our knowledge the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.