Section 1 - Product and Company Information

Product Name: DL-Malic acid, 99+%  
Product Number: 240176  
Brand: Aldrich Chemical  
Company: Sigma-Aldrich  
Street Address: 3380 Spruce Street  
City, State, Zip, Country: SAINT LOUIS, MO 63133 US  
Technical Phone: 600-325-9502  
Fax: 600-325-9502  
Emergency Phone: 314-776-5555

Section 2 - Composition/Information on Ingredient

<table>
<thead>
<tr>
<th>Substance Name</th>
<th>CAS #</th>
<th>GABA 219</th>
<th>EC no</th>
<th>Annex I Index</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>DL-MALIC ACID</td>
<td>6915-15-7</td>
<td>No</td>
<td>230-022-8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Formula: C4H6O5  
Synonyms: Butanedioic acid, hydroxy- (9CI), Monoxybutanediol acid, Malic acid, alpha-Malic acid, Pyruvic acid, Malic acid, hydroxy-  

Section 3 - Hazards Identification

Emergency Overview: Harmful. Harmful if swallowed. Risk of serious damage to eyes. Irritating to respiratory system and skin.

HMSI Rating  
Health: 2  
Flammability: 0  
Reactivity: 0

NFPA Rating  
Health: 2  
Flammability: 0  
Reactivity: 0

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

Oral Exposure: If swallowed, wash out mouth with water provided person is conscious. Call a physician.

Inhalation Exposure: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Dermal Exposure: In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

Section 5 - Fire Fighting Measures

Explosion Data:  
Dust Potential: This material, like most materials in powder form, is capable of creating a dust explosion.

Autoignition Temp: 340 °C

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

Firefighting:  
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Specific Hazard(s):  
Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

Procedure to be Followed in Case of Leak or Spill: Evacuate area.

Procedure(s) of Personal Precaution(s): Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

Methods for Cleaning Up: Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

Handling:  
User Exposure: Do not breathe dust. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

Storage:  
Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

Engineering Controls: Safety shower and eye bath. Mechanical exhaust required.

Personal Protective Equipment:  
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator.

Hand: Compatible chemical-resistant gloves.

Eye: Chemical safety goggles.
Section 9 - Physical/Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td></td>
</tr>
<tr>
<td>Physical State</td>
<td>Solid</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>134.09 AMU</td>
</tr>
<tr>
<td>pH</td>
<td>N/A</td>
</tr>
<tr>
<td>BP/MP Range</td>
<td>N/A</td>
</tr>
<tr>
<td>MP/MP Range</td>
<td>131 - 133 °C</td>
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<tr>
<td>Freezing Point</td>
<td>N/A</td>
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<tr>
<td>Vapor Pressure</td>
<td>0.1 mmHg</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>4.6 g/l</td>
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<tr>
<td>Saturated Vapor Conc.</td>
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<tr>
<td>SG/Density</td>
<td>1.60 g/ml</td>
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<tr>
<td>Bulk Density</td>
<td>1.000 kg/l</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>N/A</td>
</tr>
<tr>
<td>Volatility</td>
<td>N/A</td>
</tr>
<tr>
<td>VOC Content</td>
<td>N/A</td>
</tr>
<tr>
<td>Water Content</td>
<td>N/A</td>
</tr>
<tr>
<td>Solvent Content</td>
<td>N/A</td>
</tr>
<tr>
<td>Evaporation Rate</td>
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</tr>
<tr>
<td>Viscosity</td>
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<tr>
<td>Partition Coefficient</td>
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<tr>
<td>Decomposition Temp.</td>
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</tr>
<tr>
<td>Flash Point °F</td>
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</tr>
<tr>
<td>Flash Point °C</td>
<td>N/A</td>
</tr>
<tr>
<td>Explosion Limits</td>
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<tr>
<td>Flammability</td>
<td>N/A</td>
</tr>
<tr>
<td>Autoignition Temp</td>
<td>340 °C</td>
</tr>
<tr>
<td>Solubility</td>
<td>N/A</td>
</tr>
</tbody>
</table>

N/A = not available

Section 10 - Stability and Reactivity

Stability
- Stable
- Stable
- Conditions to Avoid
  - Heat
- Materials to Avoid
  - Bases, Oxidizing agents, Reducing agents, Alkali metals

Hazardous Decomposition Products
- Carbon monoxide, Carbon dioxide
Section 15 - Regulatory Information

EU Additional Classification
Symbol of Danger: Xn
Indication of Danger
Harmful
Risk Statements
R: 22 37/38 41
Harmful if swallowed. Irritating to respiratory system and skin. Risk of serious damage to eyes.
Safety Statements
S: 26 39
In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear eye/face protection.

US Classification and Label Text
Indication of Danger
Harmful
Risk Statements
Harmful if swallowed. Risk of serious damage to eyes. Irritating to respiratory system and skin
Safety Statements
In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing and eye/face protection.

United States Regulatory Information
SARA Listed: No

TSCA Inventory Item: Yes

Canada Regulatory Information
WHMIS Classification
This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSCL: Yes
NDSL: No

Section 16 - Other Information

Disclaimer
For R&D use only. Not for drug, household or other uses.

Warranty
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to proper safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc. shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2008 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.