



Table of Contents

Introduction	2
Description & Properties	4
Health Information	6
Environmental Information	8
Regulatory Information	9
Exposure Potential	10

Introduction

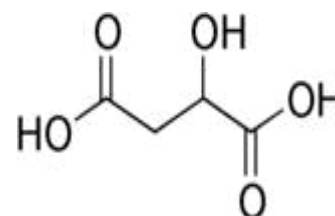
- ❖ As Thirumalai Chemicals Limited, we have continually committed to protecting our society and the environment by safe with care operational manufacturing base capable and are delivering quality products with excellent logistics and technical support.
- ❖ Malic Acid, the natural acid constituent of apple, finds wide application in the food industry. Due to its compatibility with all types of flavour, the flavour enhancing property, the sharp, lingering acid taste and the high water solubility nature, it is ideally suited for the preparation of Juices, Soft drinks, Cider and Wines.



Product Stewardship Summary

DL Malic Acid

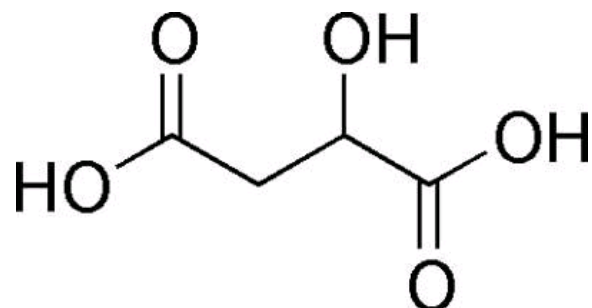
- ❖ Its' non-hygroscopic, free flowing nature, makes it the preferred acid for dry squash juice mixes. When used in sugar confectionery, the low melting point of Malic Acid gives greater clarity to the finished product.
- ❖ In diet products, it suppresses the bitter after taste of artificial sweeteners and reduces the amount needed, without affecting the sweetness. In fruit and vegetable canning, malic Acid is used for pH adjustment. In the edible oil processing / refining it is used to remove and control traces of metal impurities and as a synergist in admixture with antioxidants, to control rancidity.
- ❖ In cheese preparation, it increases the product yield. Malic Acid is also used in Pharmaceuticals, Cosmetics, Metal cleaning and textile finishing.



Product Stewardship Summary

DL Malic Acid

Description and properties



- Malic acid is a natural substance found in plants and is an essential part of the Krebs Cycle. Malic acid is an important organic compound having sharp, clean, tart, acidic taste. It is free flowing, stable and non-hygroscopic.
- Oxidising properties based on the fact that Malic acid is incapable of reacting exothermically with combustible materials. There are no chemical groups associated with explosive properties in the molecule.



Product Stewardship Summary

DL Malic Acid

- ❖ No spontaneous combustion when mixed with air / water. Thermally stable. Not classified as flammable for transport. Oxidising potential: NIL
- ❖ DL Malic acid (2-hydroxy butanedioic acid) is manufactured through the hydration of Fumaric acid (trans-1, 2-ethylenedicarboxylic acid). A water molecule is added to each molecule of Fumaric acid. This is done under heat with high pressure. The duration of reaction determines the completeness of hydration.
- ❖ The main process is performed in water solution. The Malic acid is highly soluble in water. The residual Fumaric acid is separated by sub zero temperature conditions. Two stages of crystallisation followed by filtration /centrifugation, with intermediate purification processes result in purified DL Malic acid. The wet Malic acid is dried, sieved and bagged. Water used for the unit operations of crystallisation, filtration /centrifugation and purification processes is recycled.



Health Information

- Studies of Malic acid by the dermal, oral and inhalation routes of exposure indicate that these substances are relatively low in acute toxicity by all the three routes of exposure.
- Malic acid is considered to be of low toxicity and is widely used in food.
- Studies indicate that these substances are not irritating to the skin but moderately irritating to the eyes. Studies have not shown any evidence of skin sensitization.
- Malic acid is considered valid as metabolism of fumaric acid to malic acid is a key part of the Krebs Cycle. Malic acid occur naturally in many foods and synthetic forms of these acids are considered suitable as food additives.



- Repeated dose toxicity studies with Malic acid demonstrated that none of the tested substances caused systemic toxicity. Toxicity studies conducted by oral exposure demonstrate that Malic acid do not cause developmental malformation.
- Dietary exposure also results from the large volume of malic acid used as a food acidulant. The major route of exposure of the general population to exogenous malic acid is through consumption of food and beverages.



Environmental Information:

Malic acid is readily biodegradable. Malic acid is stable in water and will not hydrolyse or otherwise degrade to form hazardous or non-biodegradable metabolites. No bioconcentration potential due to high water solubility, low fat solubility and rapid biodegradation and metabolism

Malic acid is concluded to have moderate to low toxicity to aquatic organisms. (Daphnia)

Low hazard is identified for terrestrial plant, soil micro organism, terrestrial organism and sewage treatment plant.

The material safety Data sheet provided with the product contains suggested spill response and clean up procedure.



Regulatory Information

Requirements may exist that govern the manufacture, importation, sale, transportation, use, and / or disposal of Malic acid or products containing them.

These requirements may vary by jurisdiction. For more information, consult the relevant Material Safety Data Sheet (MSDS) or contact us.

Thirumalai Chemicals' Malic Acid meets the Food Chemical Codex specifications. German Food additive purity regulation, allows Malic Acid to be added to all food products, without any quantitative limit.

In UK Malic Acid is approved for use by the following:

1. The food standards (Preserves) order - 1953
2. The Softdrinks regulation 1964, amended 1995
3. Miscellaneous additive in Food regulation 1980 No.1834 for general use for an acidulant.

In India, Malic acid has been approved for use in carbonated beverages and as an acidulant in miscellaneous foods by - Prevention of Food Adulteration Act 1954.



Product Stewardship Summary

DL Malic Acid

Exposure Potential

Malic acid is manufactured in a closed batch reactor where opportunity for exposure can arise, e.g. during charging, sampling or discharge of the material. There is also potential exposure to workers during transfer of malic acid when filling the trucks with final product or when transferring the material into drums for further use.

Exposure to malic acid is likely during charging, sampling or discharge of the material. Workers involved in the production, handling, sampling and transfer of materials are well-trained in these procedures and they use eye goggles, plastic gloves (no specific requirements but for example neoprene and coated neoprene / rubber / nitrile rubber gloves) and clothing with long sleeves and long legs, in order to minimise exposure.



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This summary is based on
information as of December'2017.

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