

1. IDENTIFICATION

1.1. Product identification

Product Name	Bio-based succinic acid
Chemical name	succinic acid butanedioic acid
CAS number	110-15-6
EC number	203-740-4

1.2. Relevant identified uses of the substance or mixture and uses advised against

Applications	Intermediate
Identified uses	Manufacture via a fermentation procedure Industrial distribution Formulation (chemical products for water treatment) Formulation (welding products) Final industrial use (pH regulator, flocculating agent, precipitant, neutralisation agent, other non-specified) Final industrial use (water treatment) Final industrial use (welding products) Final industrial use (monomeric) Final industrial use (intermediate in a formulation) Final industrial use (esterification and other synthesis processes) Final industrial use (hydrogenation) Final industrial use (food additives)

1.3. Details of the supplier

Name	BioAmber Sarnia Inc.
Manufactured at	1201 Vidal St. South Sarnia ON N7T 7M2 CANADA
Phone	+1 519-344-0065 #110
Contact email	Sarnia.CustomerService@bio-amber.com

1.4. Emergency phone number

For Hazardous Materials Incidents
Spill, Leak, Fire, Exposure, or Accident :
Call CHEMTREC Day or Night
Within USA and Canada: 1-800-424-9300
Outside USA and Canada: +1 703-527-3887 (collect calls accepted)

2. HAZARD IDENTIFICATION

2.1. Classification of the substance

2.1.1. Classification of the substance according to OSHA HCS 2012

Eye Damage Category 1 Causes serious eye damage

2.1.2. Classification of the substance according to HMIS Classification

Health hazard: 2
Flammability: 0
Physical hazards: 0

2.1.3. Classification of the substance according to NFPA Rating

Health: 2
Flammability: 0
Instability: 0

2.1.4. Classification of the substance according to WHMIS

Class D2B (eye irritation)

2.2. Labelling elements according to OSHA HCS 2012

Symbol



Signal word: Danger
Hazard statement: Causes serious eye damage
Precaution statements: Wear eye protection/face protection.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a physician.

2.3. Other dangers

Potential effects on health (not fulfilling the criteria for classification):
Inhalation: May be harmful if inhaled. Causes respiratory tract irritation.
Cutaneous: May cause skin irritation.
Ingestion: May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	Common name/Synonyms	CAS number	EC number	[%]
Succinic acid	Butanedioic acid Bio-based succinic acid	110-15-6	203-740-4	98-100

4. FIRST AID MEASURES

4.1. First aid description

General instructions: Consult a doctor. Show this safety data sheet to the doctor to help him/her provide the right assistance. Move away from the danger zone.

If inhaled	If inhaled, get the person in question into fresh air. If they are no longer breathing, perform artificial respiration. Consult a doctor.
In the event of skin contact	Rinse with soap and plenty of water. Consult a doctor.
In the event of contact with the eyes	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a physician.
If ingested	Never administer anything by mouth to an unconscious person. Rinse the mouth with water. Consult a doctor.

4.2. Principal symptoms and effects, both acute and delayed

Eye contact will result in strong irritation. No known delayed effects.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

5. FIREFIGHTING MEASURES

5.1. Extinguishing methods	<u>Appropriate:</u> water jet, alcohol-resistant foam, dry chemical products or carbon dioxide.
5.2. Specific hazards from the substance or mixtures	Hazardous decomposition products formed under fire conditions - Carbon oxides
5.3. Special protective equipment and precautions for fire-fighters	Wear self-contained breathing apparatus if necessary.

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures	Use personal protection equipment. Avoid producing dust. Avoid breathing in dust. Ensure that ventilation is adequate.
6.2. Environmental protection precautions	Do not let the product get into the drains.
6.3. Methods and materials for containment and cleaning	Gather and dispose of without creating dust. Store in closed containers that are appropriate for disposal.

7. HANDLING AND STORAGE

7.1. Precautions to be taken for safe handling	Avoid contact with skin and eyes. Avoid producing dust or aerosols. Provide appropriate ventilation in locations where dust is generated. The usual preventive measures for protecting against fire.
7.2. Safe storage conditions, including any	Use tightly sealed containers and store them in a dry and well-ventilated space.

incompatibilities

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Exposure limits
OSHA: Not established
ACGIH: Not established

8.2. Personal protection

Appropriate engineering measures
No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Personal protection equipment
Eye/face protection: Wear eye protection/face protection.

Skin/hand protection: Wear gloves when handling. Select bodily protection measures depending on the quantity and concentration of the hazardous substance in the workplace.

Respiratory protection: If the risk assessment shows that gas masks with air purifying filters are appropriate, use a type N95 mask (US) or a type P3 (EN 143) respirator. Use masks that have been tested and approved to the appropriate standards such as NIOSH (US) or CEN (EU).

Hygiene measures: Handle in accordance with industrial good hygiene and safety practices. Wash hands before breaks and at the end of the day.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information about the essential physical and chemical properties

Physical state	Powder
Colour	White
Odour	Odourless
Olfactory threshold	Not determined
pH	2.4 to 2.8 (1% aqueous solution)
Melting point/freezing point	185 to 187°C
Boiling point	235°C
Flash point	Not applicable. The flash point is a property that is relevant for liquids and solids with low melting points. Succinic acid has a melting point above 185°C.
Evaporation rate	Not determined

Flammability (solid, gas)	Succinic acid is non-flammable. Practical experience with this substance has shown that succinic acid is not pyrophoric and does not emit flammable gases when it comes into contact with water.
Upper/lower flammability limits or explosive limits	Not determined
Vapour pressure	0.000025 Pa (25°C)
Vapour density	Not determined
Relative density	0.9 (at 20°C)
Solubility in water	83 g/L (at 25°C)
In other solvents	Not determined
Partition coefficient: <i>n</i> -octanol/water	Log K_{ow} : -0.59
Auto-ignition temperature	No auto-ignition temperature could be determined up to 220°C, a temperature that is already above the melting point.
Decomposition temperature	Not determined
Viscosity	Not applicable. Succinic acid is a solid.
Explosive properties	Not applicable. Succinic acid does not contain any chemical groups that are associated with explosiveness. Succinic acid is not expected to be sensitive to static discharge.
Oxidising properties	Not applicable. Succinic acid does not contain any chemical structures that would suggest oxidising properties.

9.2. Other information

Kst, Pmax: Kst = 51 bar.m/s - Pmax = 7.4 bar
Minimum energy for inflammability > 1000 mJ
Inflammability temperature (cloud) min. 620°C

10. STABILITY AND REACTIVITY

10.1. Reactivity	Succinic acid does not become liquid during transport. It is therefore exempt from corrosiveness tests with respect to metals.
10.2. Chemical stability	Stable under the recommended storage conditions.
10.3. Potential for dangerous reactions	Under normal conditions of storage and use, hazardous polymerization will not occur
10.4. Conditions to be avoided	Not available.
10.5. Incompatible materials	Bases, oxidising agents, reducing agents
10.6. Dangerous decomposition products	In the event of a fire: carbon dioxide and carbon monoxide

11. TOXICOLOGICAL INFORMATION

11.1. Information about toxicological effects

Routes of Entry	Inhalation, ingestion, and dermal and eye contact
Acute toxicity	<p>The acute toxicity of succinic acid is low:</p> <p>- <u>oral</u>:</p> <p>Results of studies into rats by Fisher 344 (Guideline OECD 401) LD₅₀ (rat, oral): 6740 mg/kg bw</p> <p>- <u>cutaneous</u>:</p> <p>Not determined</p> <p>- <u>inhalation</u>:</p> <p>Results of studies into rats by Sprague-Dawley (Guideline OECD 403) LC₅₀ (rat, inhalation): 1284 mg/m³ air</p>
Skin corrosion/skin irritation	Results of studies into rabbits (Guideline OECD 404, EU B.4): not irritant.
Severe eye injuries/eye irritation	Results of studies into rabbits (Guideline OECD 405, EU B.5): strong irritant.
Respiratory or cutaneous sensitisation	<p><u>Respiratory</u>:</p> <p>Comparative reading of the results for fumaric acid indicates that there will be no topical effects on the respiratory system.</p> <p><u>Cutaneous</u>:</p> <p><i>Local lymph node assay (LLNA)</i>: non-sensitising <i>Guinea pig maximisation test (GPMT)</i>: non-sensitising</p>
Stem cell mutagenicity	<p>Result of the Ames test: negative</p> <p>Result of the chromosomal aberration test: negative</p>
Carcinogenicity	<p>Results of studies into rats by Fisher 344 (Guideline OECD 451): comparative reading of the results for succinate indicates there will be neither toxicity nor carcinogenic activity.</p> <p>NOAEL_{oral}: 860 mg/kg bw/day</p> <p>NTP: Not listed IARC: Not listed OSHA: Not listed</p>
Reproductive toxicity	There are no indications of any toxicity in terms of reproduction or development.
Teratogenicity/Embryotoxicity	There are no indications of any toxicity in terms of teratogenicity or embryotoxicity.
Specific toxicity for various target organs - single exposure	Not determined
Specific toxicity for various target organs - repeated exposure	<p><u>Oral</u>:</p> <p>Results of studies into rats (Guideline OECD 408): NOAEL: 860 mg/kg bw/day (chronic; rat)</p>

Hazards due to aspiration	Not applicable. Succinic acid is a solid.
Toxicologically Synergistic Materials	Not available

11.2. Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Cutaneous	May cause skin irritation.
Eye	Strong irritant. Causes serious eye damage.

12. ECOLOGICAL INFORMATION

12.1. Toxicity	No dangers have been identified at biologically relevant concentrations. <u>Aquatic toxicity</u> Acute toxicity, fish (Guideline OECD 203): LC ₅₀ fresh water (<i>Danio rerio</i>) 96h >100 mg/L. Acute toxicity, invertebrates (Guideline OECD 202): EC ₅₀ 48h fresh water (<i>Daphnia magna</i>) in a test with pH adjustment >100 mg/L. Acute toxicity, algae (Guideline OECD 201): EC ₅₀ 72h fresh water (<i>Pseudokirchnerella subcapitata</i>) >100 mg/L. NOEC 100 mg/L. Toxicity to micro-organisms (Guideline OECD 209): EC ₅₀ 3h fresh water (activated sludge) >300 mg/L. Results of a study into biodegradability in water (Guideline OECD 301 E): easily biodegradable
12.2. Persistence and degradability	
12.3. Bioaccumulation potential	Log Kow < 4.5: non-bioaccumulating
12.4. Mobility in the soil	The substance only has a weak adsorption potential
12.5. Results of PBT and vPvB evaluations	The substance is neither persistent, nor bioaccumulating, nor toxic
12.6. Other undesirable effects	None known.

13. DISPOSAL CONSIDERATIONS

13.1. Waste handling methods	Respect the regulations in force. Contact an accredited service professional for disposal of this product. Contaminated packaging: dispose of with unused product
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14. INFORMATION FOR TRANSPORT

	Transport by land (ADR/RID)	Transport by river (ADN)	Transport by sea (IMDG)	Transport by air (ICAO-TI / IATA-DGR)
14.1. UN number	Not regulated for transport			
14.2. UN shipping name	Not regulated for transport			
14.3. Hazard class or classes	Not regulated for transport			
14.4. Packaging group	Not regulated for transport			
14.5. Environmental hazards:	Not regulated for transport			
14.6. Classification	Non-hazardous goods			
14.7. Additional information	Not regulated for transport			

14.8. Specific precautions to be taken by the user

Not Available

14.9. Bulk transport in accordance with Appendix II of MARPOL 73/78 and the IBC Code

Not Applicable

15. REGULATORY INFORMATION

15.1

Regulations/legislation specific to the substance or mixture regarding safety, health and the environment

International regulations

This product is found on the following international chemical substances lists :

Countries	Lists
Australia	AICS
Canada	DSL
China	IECS
European Union	EINECS
Japan	ENCS
Korea	ECL
Philippines	PICCS
United States	TSCA
New Zealand	NZIoC

Canada:

WHMIS: Class D2B (Eye irritation)

- DSL Status: All the components of this product can be found on the Canadian DSL list

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* and the MSDS contains all the information required by the *Controlled Products Regulations*.



USA:

This product has been classified in accordance with the 2012 hazard criteria of the *Occupational Safety and Health Administration's (OSHA) Hazard Communication Standard (HCS)* and the SDS contains all the information required by the 29 CFR § 1910.1200 .

- SARA 302: None of the chemical components of this material are subject to the reporting requirements of SARA Title III, Section 302.

- SARA 313: This material does not contain any CAS chemical constituents that are known to exceed the threshold established by SARA Title III, Section 313.

- SARA 311/312 Hazards: Acute Health Hazard

- Massachusetts Right To Know Components: None of the chemical components of this material are subject to the requirements of the Massachusetts Right to Know Act.

- Pennsylvania Right To Know Components

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- New Jersey Right To Know Components:

Succinic acid: CAS number 110-15-6

Revision Date

- California Prop. 65 Components:

This product does not contain any chemical substances known in the state of California to cause cancer, congenital malformations or any other reproductive damage.

16. OTHER INFORMATION

16.1. Information about the revision

SDS created on April 23 2015. BioAmber Sarnia version.

Version 1.1. Jan 19 2016. Minor changes made to Section 15.1.

16.2. Meanings of the abbreviations and acronyms used

ACGIH: American conference of Governmental Industrial Hygienists

ADN/ADNR: regulations relating to the transportation of hazardous substances in barges on navigable waterways

ADR/RID: European agreement relating to international transport of hazardous goods by road/regulations relating to the international transport of hazardous goods by rail

CAS number: Chemical Abstract Service number

CEN: European Committee for Standardisation

CLP: classification, labelling and packaging

DSL: Domestic Substances List

EC number: European Commission number

EC₅₀: Effective Concentration – 50%

EU: European Union

HCS: Hazard Communication Standard

HMIS: Hazardous Material Information System

IARC: International Agency for Research on Cancer

IATA-DGR: International Air Transport Association – Dangerous Goods Regulations

IBC: International Bulk Chemical
ICAO-TI: International Civil Aviation Organization - Technical Instructions
IMDG: International Maritime Dangerous Goods Code
LC₅₀: Lethal Concentration – 50%
LD₅₀: Lethal Dose – 50%
MARPOL: International Convention for the Prevention of Pollution From Ships
MSDS: Material Safety Data Sheet
NFPA: National Fire Protection Association
NIOSH: National Institute for Occupational Safety and Health
NOAEL: No Observed Adverse Effect Level
NOEC: No Observed Effect Concentration
NTP: National Toxicology Program
OECD: Organisation for Economic Co-operation and Development
OSHA: Occupational Safety and Health Administration
PBT: Persistent Bioaccumulative Toxic Substances
Prop.: Proposition
SARA: Superfund Amendments and Reauthorization Act
SDS: Safety Data Sheet
UN number: United Nations number
vPvB: very Persistent and very Bioaccumulative
WHMIS: Workplace Hazardous Material Information System

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