

Safety Data Sheet

according to Regulation (EC) No. 453/2010 and according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 22/02/2011

Revision date: 27/10/2016

Supersedes: 27/01/2012

Version: 4.0

CLM-4454

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Substance

 Substance name
 : FUMARIC ACID (1,4-13C2, 99%)

 EC index no
 : 607-146-00-X (Unlabeled)

 EC no
 : 203-743-0 (Unlabeled)

 CAS No
 : 110-17-8 (Unlabeled)

 REACH registration No
 : 01-2119485492-31

Product code : CLM-4454

Formula : HOO*CCH=CH*COOH

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

1.2.1. Relevant identified uses

Main use category : Professional use

Industrial/Professional use spec : For professional use only

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

Cambridge Isotope Laboratories, Inc.

50 Frontage Road Andover, MA 01810

USA

USA: 1-800-322-1174 Int: 1-978-749-8000 cilsales@isotope.com www.isotope.com

Emergency telephone number

Emergency numbers:

Chemtrec: 1-800-424-9300 (24 hours) International: 1-703-741-5970 (24 hours)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Eye Irrit. 2 H319

Full text of H-statements: see section 16

Classification according to Directive 67/548/EEC [DSD] or 1999/45/EC [DPD]

Xi; R36

Full text of R-phrases: see section 16

GHS-US classification

Eye Irrit. 2A H319

Adverse physicochemical, human health and environmental effects

Kidney.

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP)



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Signal word (CLP) : Warning

Hazard statements (CLP) : H319 - Causes serious eye irritation

Precautionary statements (CLP) P264 - Wash Both hands thoroughly after handling

P280 - Wear protective clothing, protective gloves
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 eye irritation persists: Get medical advice/attention

GHS-US labelling

Hazard pictograms (GHS-US)



Signal word (GHS-US) : Warning

Hazard statements (GHS-US) : H319 - Causes serious eye irritation

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P280 - Wear protective clothing, protective gloves

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 eye irritation persists: Get medical advice/attention

Other hazards

No additional information available

SECTION 3: Composition/information on ingredients

Substance 3.1.

Name	Product identifier	%	Classification according to Directive 67/548/EEC
FUMARIC ACID (1,4-13C2, 99%) (Main constituent)	(CAS No) 110-17-8 (Unlabeled) (EC no) 203-743-0 (Unlabeled) (EC index no) 607-146-00-X (Unlabeled) (REACH-no) 01-2119485492-31	100	Xi; R36
Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
FUMARIC ACID (1,4-13C2, 99%) (Main constituent)	(CAS No) 110-17-8 (Unlabeled) (EC no) 203-743-0 (Unlabeled) (EC index no) 607-146-00-X (Unlabeled) (REACH-no) 01-2119485492-31	100	Eye Irrit. 2, H319

Full text of R- and H-statements: see section 16

Name	Product identifier	%	GHS-US classification
FUMARIC ACID (1,4-13C2, 99%) (Main constituent)	(CAS No) 110-17-8 (Unlabeled)	100	Eye Irrit. 2A, H319

Full text of H-statements: see section 16

Mixture

Not applicable

SECTION 4: First aid measures

Description of first aid measures

: Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of First-aid measures general dangerous area.

First-aid measures after inhalation : If breathed in, move person to fresh air. If not breathing, give artificial respiration. Consult a physician.

First-aid measures after skin contact : Wash with soap and plenty of water. Consult a physician.

: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. First-aid measures after eye contact

: Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a First-aid measures after ingestion physician.

Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : May be harmful if inhaled. Causes respiratory tract irritation.

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Symptoms/injuries after skin contact : May be harmful if absorbed through the skin. Causes skin irritation.

Symptoms/injuries after eye contact : Causes serious eye irritation. Symptoms/injuries after ingestion : May be harmful if swallowed.

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

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Use water spray, alcohol-resistant foam, dry chemical, or carbon dioxide.

5.2. Special hazards arising from the substance or mixture

No additional information available

5.3. Advice for firefighters

Firefighting instructions : Wear self contained breathing apparatus for fire fighting if necessary.

Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures : Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Avoid breathing dust.

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3. Methods and material for containment and cleaning up

For containment : Pick up and arrange disposal without creating dust. Sweep up and shovel. Do not flush with water. Keep in suitable, closed containers for disposal.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed

: Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Provide appropriate exhaust ventilation at places where dust is formed. Provide appropriate exhaust ventilation at places where dust is formed.

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

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Keep container tightly closed in a cool, dry and well-ventilated place.

Storage conditions : Store at room temperature away from light and moisture.

7.3. Specific end use(s)

No additional information available

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SECTION 8: Exposure controls/personal protection

8.1. Control parameters

FUMARIC ACID (1,4-13C2, 99%) (110-17-8 (Unlabeled))		
DNEL/DMEL (Workers)		
Acute - systemic effects, dermal	50 mg/kg bodyweight/day	
Acute - systemic effects, inhalation	175 mg/m³	
Long-term - systemic effects, dermal	50 mg/kg bodyweight/day	
Long-term - systemic effects, inhalation	175 mg/m³	
DNEL/DMEL (General population)		
Acute - systemic effects, dermal	30 mg/kg bodyweight	
Acute - systemic effects, inhalation	53 mg/m³	
Acute - systemic effects, oral	30 mg/kg bodyweight	
Long-term - systemic effects,oral	30 mg/kg bodyweight/day	
Long-term - systemic effects, inhalation	53 mg/m³	
PNEC (Water)		
PNEC aqua (freshwater)	0.1 mg/l	
PNEC aqua (marine water)	0.01 mg/l	
PNEC aqua (intermittent, freshwater)	1 mg/l	
PNEC (STP)		
PNEC sewage treatment plant	3 mg/l	

8.2. Exposure controls

Appropriate engineering controls : Handle in accordance with good industrial hygiene and safety practice. Wash hands before

breaks and at the end of workday.

Personal protective equipment : Gloves. Protective clothing. Protective goggles. Self-contained breathing apparatus.









Materials for protective clothing : Wear suitable protective clothing and gloves. Hand protection : Wear suitable protective clothing and gloves.

Eye protection : Wear safety glasses with side shields (or goggles) and a face shield.

Skin and body protection : Choose body protection according to the amount and concentration of the dangerous substance

at the work place.

Respiratory protection : When appropriate, use NIOSH/CEN approved respirator.

Environmental exposure controls : Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid Appearance : Solid.

Molecular mass : 118.06 g/mol (Labeled)

Colour : white.

Odour : No data available
Odour threshold : No data available

pH : 2.1 at 4.9 g/l at 20 °C (68 °F)

Relative evaporation rate (butylacetate=1) : No data available

Melting point : 298 - 300 °C (568 - 572 °F)

Freezing point : No data available
Boiling point : No data available

Flash point : $230 \,^{\circ}\text{C} \, (446 \,^{\circ}\text{F})$ - closed cup - DIN 51755 Part 1 Auto-ignition temperature : $399 \,^{\circ}\text{C} \, (750 \,^{\circ}\text{F})$ at 1,013 hPa (759.8 mmHg)

Decomposition temperature : No data available Flammability (solid, gas) : No data available

Vapour pressure : 2.2 hPa (1.7 mmHg) at 165 °C (329 °F)

Relative vapour density at 20 °C : No data available

Relative density : 1.635 g/cm3 at $20 ^{\circ}\text{C}$ ($68 ^{\circ}\text{F}$) Solubility : Water: 7 g/l at 25 $^{\circ}\text{C}$ ($77 ^{\circ}\text{F}$) - soluble

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: 0.46 at 20 °C (68 °F) Log Pow Log Kow : No data available Viscosity, kinematic : No data available Viscosity, dynamic : No data available : No data available Explosive properties Oxidising properties : No data available : 3 - 40 % (V) Explosive limits

Other information

No additional information available

SECTION 10: Stability and reactivity

Reactivity

No additional information available

Chemical stability 10.2.

Stable if stored under recommended conditions.

Possibility of hazardous reactions

No additional information available

Conditions to avoid

Not available.

10.5. Incompatible materials

Oxidizing agenst, Amines, Strong bases.

Hazardous decomposition products

Carbon oxides (CO, CO2).

SECTION 11: Toxicological information

Information on toxicological effects

: Not classified Acute toxicity

FUMARIC ACID (1,4-13C2, 99%) (110-17-8 (Unlabeled))		
LD50 oral rat	9300 mg/kg female (OECD Test Guideline 401)	
LD50 dermal rabbit	20000 mg/kg female (OECD Test Guideline 402)	
ATE CLP (oral)	9300.000 mg/kg bodyweight	
ATE CLP (dermal)	20000.000 mg/kg bodyweight	
	LD50 Intraperitoneal - Mouse - 100 mg/kg	
Repeated dose toxicity Rat - male - Oral - NOAEL	600 mg/kg	

Skin corrosion/irritation : Skin - rabbit - Mild skin irritation - 4 h. (OECD Test Guideline 404)

pH: 2.1 at 4.9 g/l at 20 °C (68 °F)

Serious eye damage/irritation : Eyes - rabbit Result: Irritating to eyes. (OECD Test Guideline 405)

pH: 2.1 at 4.9 g/l at 20 °C (68 °F)

Respiratory or skin sensitisation : Maximisation Test - Guinea pig Result: Does not cause skin sensitization. (OECD Test

Guideline 406)

Germ cell mutagenicity : Mouse - lymphocyte Result: negative

: Not classified Carcinogenicity Reproductive toxicity : Not classified Specific target organ toxicity (single exposure) : Not classified Specific target organ toxicity (repeated : Not classified exposure)

Aspiration hazard : Not classified

Potential adverse human health effects and

symptoms

: Gastrointestinal disturbance. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Stomach - Irregularities - Based on Human Evidence.

: May be harmful if inhaled. Causes respiratory tract irritation.

Symptoms/injuries after inhalation : May be harmful if absorbed through the skin. Causes skin irritation. Symptoms/injuries after skin contact

Symptoms/injuries after eye contact : Causes serious eye irritation. Symptoms/injuries after ingestion : May be harmful if swallowed.

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SECTION 12: Ecological information

12.1. Toxicity

FUMARIC ACID (1,4-13C2, 99%) (110-17-8 (Unlabeled))		
LC50 fish 1	> 100 mg/l semi-static test LC50 - Danio rerio (Zebra fish) - 96 h (OECD Test Guideline 203)	
EC50 Daphnia 1	212 mg/l Immobilization EC50 - Daphnia magna (Water flea) - 48 h (OECD Test Guideline 202)	
EC50 other aquatic organisms 1	> 300 mg/l Respiration inhibition EC50 - activated sludge - 3 h (OECD Test Guideline 209)	
ErC50 (algae)	> 100 mg/l Growth inhibition EC50 - Pseudokirchneriella subcapitata - 72 h (OECD Test Guideline 201)	

12.2. Persistence and degradability

FUMARIC ACID (1,4-13C2, 99%) (110-17-8 (Unlabeled))	
Persistence and degradability	Aerobic - exposure time: 28 d.
Biodegradation	67.5 % Readily biodegradable (OECD Test Guideline 301B)

12.3. Bioaccumulative potential

FUMARIC ACID (1,4-13C2, 99%) (110-17-8 (Unlabeled))	
Log Pow	0.46 at 20 °C (68 °F)
Bioaccumulative potential	Not available.

12.4. Mobility in soil

FUMARIC ACID (1,4-13C2, 99%) (110-17-8 (Unlabeled))	
Ecology - soil	Not available.

12.5. Results of PBT and vPvB assessment

No additional information available

12.6. Other adverse effects

Other adverse effects : Not available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Regional legislation (waste) : Waste materials should be disposed of under conditions which meet Federal, State, and Local

environmental control regulations.

Waste disposal recommendations : Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed

professional waste disposal service to dispose of this material.

Ecology - waste materials : Dispose of as unused product.

SECTION 14: Transport information

In accordance with ADR / RID / IMDG / IATA / ADN

14.1. UN number

UN-No.(DOT) : 3077 DOT NA no. UN3077

14.2. UN proper shipping name

Proper Shipping Name (DOT) : Environmentally hazardous substances, solid, n.o.s.

Transport hazard class(es) (DOT) : 9 - Class 9 - Miscellaneous hazardous material 49 CFR 173.140

Hazard labels (DOT) : 9 - Class 9 (Miscellaneous dangerous materials)



DOT Symbols : G - Identifies PSN requiring a technical name

Packing group (DOT) : III - Minor Danger

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DOT Special Provisions (49 CFR 172.102)

- : 8 A hazardous substance that is not a hazardous waste may be shipped under the shipping description "Other regulated substances, liquid or solid, n.o.s.", as appropriate. In addition, for solid materials, special provision B54 applies.
 - 146 This description may be used for a material that poses a hazard to the environment but does not meet the definition for a hazardous waste or a hazardous substance, as defined in 171.8 of this subchapter, or any hazard class as defined in Part 173 of this subchapter, if it is designated as environmentally hazardous by the Competent Authority of the country of origin, transit or destination.

335 - Mixtures of solids that are not subject to this subchapter and environmentally hazardous liquids or solids may be classified as "Environmentally hazardous substances, solid, n.o.s," UN3077 and may be transported under this entry, provided there is no free liquid visible at the time the material is loaded or at the time the packaging or transport unit is closed. Each transport unit must be leakproof when used as bulk packaging.

A112 - Notwithstanding the quantity limits shown in Column (9A) and (9B) for this entry, the following IBCs are authorized for transportation aboard passenger and cargo-only aircraft. Each IBC may not exceed a maximum net quantity of 1,000 kg:

- a. Metal: 11A, 11B, 11N, 21A, 21B and 21N
- b. Rigid plastics: 11H1, 11H2, 21H1 and 21H2
- c. Composite with plastic inner receptacle: 11HZ1, 11HZ2, 21HZ1 and 21HZ2
- d. Fiberboard: 11G
- e. Wooden: 11C, 11D and 11F (with inner liners) f. Flexible: 13H2, 13H3, 13H4, 13H5, 13L2, 13L3, 13L4, 13M1 and 13M2 (flexible IBCs must be sift-proof and water resistant or must be fitted with a sift-proof and water resistant liner).

B54 - Open-top, sift-proof rail cars are also authorized.

IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).

IP3 - Flexible IBCs must be sift-proof and water-resistant or must be fitted with a sift-proof and water-resistant liner.

N20 - A 5M1 multi-wall paper bag is authorized if transported in a closed transport vehicle.

T1 - 1.5 178.274(d)(2) Normal...... 178.275(d)(2)

TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 155 DOT Packaging Non Bulk (49 CFR 173.xxx) : 213 DOT Packaging Bulk (49 CFR 173.xxx) : 240 DOT RQ : 5000 lbs Marine pollutant : No

Additional information

Other information : No supplementary information available.

Special transport precautions : IMDG/IATA - Not dangerous goods.

Overland transport

Packing group (ADR)

Class (ADR) : 9 - Miscellaneous dangerous substances and articles

Hazard identification number (Kemler No.) : 90 Classification code (ADR)

Danger labels (ADR) : 9 - Miscellaneous dangerous substances and articles



Orange plates



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Tunnel restriction code : E
Limited quantities (ADR) 5kg
EAC code : 2Z
Excepted quantities (ADR) : E1

Transport by sea

DOT Vessel Stowage Location : A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a

passenger vessel.

MFAG-No : 171

Air transport

DOT Quantity Limitations Passenger aircraft/rail : No limit

(49 CFR 173.27)

DOT Quantity Limitations Cargo aircraft only (49 : No limit

CFR 175.75)

Civil Aeronautics Law : Miscellaneous dangerous substances & articles(Hazardous materials notice Appended Table 1

Article 194 of the Enforcement Regulations)

14.4. Environmental hazards

Other information : No supplementary information available.

14.5. Special precautions for user

Special transport precautions : IMDG/IATA - Not dangerous goods.

14.6. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

SECTION 15: Regulatory information

15.1. US Federal regulations

FUMARIC ACID	(1.4-13C2	99%) (110	0-17-8	(Unlabeled))
I UIIIAINIU AUID	(I, T IJOZ,	33/0/(11)	U- 1 1 -U 1	(Olliabelea))

SARA Section 311/312 Hazard Classes Immediate (acute) health hazard
Delayed (chronic) health hazard

15.2. International regulations

CANADA

FUMARIC ACID (1,4-13C2, 99%) (110-17-8 (Unlabeled))

Listed on the Canadian DSL (Domestic Substances List)

15.2.1. National regulations

No additional information available

15.3. US State regulations

FUMARIC ACID (1,4-13C2, 99%)(110-17-8 (Unlabeled))

State or local regulations

U.S. - Massachusetts - Right To Know List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - New Jersey - Right to Know Hazardous Substance List
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

SECTION 16: Other information

Other information : This product is not radioactive. The data given for this product are those of the corresponding

unlabeled compound, unless specifically indicated otherwise. Health and safety data for labeled compounds are generally not available, but are assumed to be similar or identical to the

corresponding unlabeled compound.

Full text of R-, H- and EUH-statements:

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Eye Irrit. 2	Serious eye damage/eye irritation, Category 2
H319	Causes serious eye irritation
R36	Irritating to eyes
Xi	Irritant

NFPA health hazard : 2 - Intense or continued exposure could cause temporary

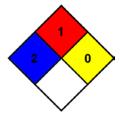
incapacitation or possible residual injury unless prompt

medical attention is given.

NFPA fire hazard : 1 - Must be preheated before ignition can occur.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions,

and are not reactive with water.



HMIS III Rating

Health : 2 Moderate Hazard - Temporary or minor injury may occur

Flammability : 1 Slight Hazard
Physical : 0 Minimal Hazard

CIL Multi-Solvent Mixture SDS

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

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