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
Index number	-
REACH registration number	01-2119896114-34-0011

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) Formulation (other 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) Professional and consumer use (Fertilizers) Professional use (washing and cleaning products, water softeners, cosmetics) Consumer use (washing and cleaning products, water softeners)

1.3. Details of the supplier of the safety data sheet

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

Phone	+ 33 (0)1-4542-5959 (ORFILA) For Hazardous Materials [*or* Dangerous Goods] 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) France: + 33 (9) 75 18 14 07 Germany: 0800 – 181 - 7059 Holland: + 31 (8) 58 88 05 96 Belgium: + 32 (2) 80 83 237 Poland: + 48 (2) 23 98 80 29 Japan (Tokyo): + 81 (3) 45 20 96 37 China: 4001 – 204937

South Korea: 00 – 3087 – 13 – 2549
Taiwan: 00801 – 14 – 8954

2. HAZARD IDENTIFICATION

2.1. Classification of the substance

2.1.1. Classification of the substance according to the DSD (Directive 67/548/EEC)

Xi; IRRITANT	R41 Risk of serious damage to the eyes.

2.1.2. Classification of the substance according to the CLP regulation (EC no. 1272/2008)

Eye Damage 1	H318 Can cause serious damage to the eyes.

2.2. Labelling elements according to the CLP regulation (EC no. 1272/2008)

Hazard symbols

Warning notice	Danger
Danger notice	H318 Can cause serious damage to the eyes.
Recommended precautions Prevention	P280 Wear protective gloves / protective clothing / protective equipment for eyes and face.
Recommended precautions Intervention	P305+P351+P338 IN CASE OF CONTACT WITH THE EYES: rinse carefully with water for several minutes. Remove contact lenses if the victim is wearing them and if they can be removed easily. Continue rinsing. P310 Call a POISON CENTRE or doctor immediately.
Recommended precautions Storage	-
Recommended precautions Disposal	-
Additional danger notices	-

2.3. Other dangers

Potential effects on health (not fulfilling the criteria for classification):

Inhalation: irritates the respiratory system

Cutaneous: irritates the skin

Ingestion: may be toxic if ingested

3. COMPOSITION/INFORMATION ABOUT THE INGREDIENTS

Name	CAS number	EC number	Index number	[%]	Classification DSD/CLP	Specific concentration limits
Succinic acid	110-15-6	203-740-4	-	98-100	Xi; R41	-
					Eye damage 1; H318	-

4. FIRST AID

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 carefully with plenty of water for at least 15 minutes and consult a doctor.
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

Not available

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

Not available

5. FIREFIGHTING MEASURES

5.1. Extinguishing methods	Appropriate: water jet, alcohol-resistant mist, dry chemical products or carbon dioxide.
5.2. Specific hazards from the substance or mixtures	Not available
5.3. Advice for the fire brigade	Wear self-contained breathing apparatus if necessary.

6. MEASURES TO BE TAKEN AFTER ACCIDENTAL RELEASE

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. Storage and cleaning methods and equipment	Gather and dispose of without creating dust. Store in closed containers that are appropriate for disposal.
6.4. References to other sections	See sections 7 and 8.

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 incompatibilities	Use hermetically sealed containers and store them in a dry and well-ventilated space.
7.3. Final specific use or uses	Refer to the exposure scenarios in the appendix.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Exposure limits: None

DNEL values

Staff:

Cutaneous

Acute DNEL - systemic effects: 67 mg/kg bodyweight per day

Long-term DNEL - systemic effects: 71 mg/kg bodyweight per day

Inhalation

Acute DNEL - systemic effects: 10 mg/m^3

Acute DNEL - topical effects: 10 mg/m^3

Long-term DNEL - systemic effects: 10 mg/m^3

Long-term DNEL - topical effects: 10 mg/m^3

General population:

Oral

Acute DNEL - systemic effects: 67 mg/kg bodyweight per day

Long-term DNEL - systemic effects: 43 mg/kg bodyweight per day

Cutaneous

Acute DNEL - systemic effects: 67 mg/kg bodyweight per day

Long-term DNEL - systemic effects: 43mg/kg bodyweight per day

Inhalation

Acute DNEL - systemic effects: 10 mg/m^3

	Acute DNEL - topical effects: 10 mg/m^3 Long-term DNEL - systemic effects: 10 mg/m^3 Long-term DNEL - topical effects: 10 mg/m^3
PNEC values	$PNEC_{aqua}$ (fresh water): 0.1 mg/L $PNEC_{aqua}$ (seawater): 0.01 mg/L $PNEC_{aqua}$ (intermittent releases): 1 mg/L $PNEC_{sediment}$ (fresh water): 0.079 mg/kg sediment (dry weight) $PNEC_{sediment}$ (seawater): 0.0079 mg/kg sediment (dry weight) $PNEC_{STP}$: 3 mg/L

8.2. Exposure checks

Appropriate technical checks	-
Personal protection equipment	Eye/face protection: Safety goggles with side shields, compliant with EN166. 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 gas mask (EN 143). 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.
Checks for environmental protection	-

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: *n*-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.
Oxidising properties	Not applicable. Succinic acid does not contain any chemical structures that would suggest oxidising properties.

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	Not available
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

Acute toxicity	The acute toxicity of succinic acid is low: - oral: Results of studies into rats by Fisher 344 (Guideline OCDE 401) LD_{50} (rat, oral): 6740 mg/kg bw - cutaneous: The oral value has been assumed LD_{50} (rat, cutaneous): 6740 mg/kg bw - inhalation: Results of studies into rats by Sprague-Dawley (Guideline OCDE 403) LC_{50} (rat, inhalation): 1284 mg/m³ air
Skin corrosion/skin irritation	Results of studies into rabbits (Guideline OCDE 404, EU B.4): not irritant.
Severe eye injuries/eye irritation	Results of studies into rabbits (Guideline OCDE 405, EU B.5): strong irritant. Classification: Can cause serious damage to the eyes.
Respiratory or cutaneous sensitisation	Respiratory: Comparative reading of the results for fumaric acid indicates that there will be no topical effects on the respiratory system. Cutaneous: *Local lymph node assay* (LLNA): non-sensitising *Guinea pig maximisation test* (GPMT): non-sensitising
Stem cell mutagenicity	Result of the Ames test: negative Result of the chromosomal aberration test: negative
Carcinogenicity	Results of studies into rats by Fisher 344 (Guideline OCDE 451): comparative reading of the results for succinate indicates there will be neither toxicity nor carcinogenic activity. $NOAEL_{oral}$: 860 mg/kg bw/day
Reproductive toxicity	There are no indications of any toxicity in terms of reproduction or development.
Specific toxicity for various target organs - single exposure	Not determined
Specific toxicity for various target organs - repeated exposure	Oral: Results of studies into rats (Guideline OCDE 408): NOAEL: 860 mg/kg bw/day (chronic; rat) Cutaneous: The oral value has been assumed NOAEL: 860 mg/kg bw/day (chronic; rat) Inhalation: Derived from the oral value NOAEC: 1130 mg/m³ (chronic; rat)

Hazards due to aspiration	Not determined
Other information	-

12. ECOLOGICAL INFORMATION

12.1. Toxicity

No dangers have been identified at biologically relevant concentrations.

Aquatic toxicity

Acute toxicity, fish (Guideline OCDE 203):
LC_{50} fresh water (*Danio rerio*) 96h >100 mg/L.

Acute toxicity, invertebrates (Guideline OCDE 202):
EC_{50} 48h fresh water (*Daphnia magna*) in a test with pH adjustment >100 mg/L.

Acute toxicity, algae (Guideline OCDE 201):
EC_{50} 72h fresh water (*Pseudokirchnerella subcapitata*) >100 mg/L.
NOEC 100 mg/L.

Toxicity to micro-organisms (Guideline OCDE 209):
EC_{50} 3h fresh water (activated sludge) >300 mg/L.

12.2. Persistence and degradability

Results of a study into biodegradability in water (Guideline OCDE 301 E): easily biodegradable

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

-

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

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	-			
14.2. UN shipping name	-			
14.3. Hazard class or classes	-			
14.4. Packaging group	-			
14.5. Environmental hazards:	-			
14.6. Classification	Non-hazardous goods			
14.7. Additional information	-			

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

Canadian regulations

DSL status: This substance is on the Canadian DSL list.

US regulations

- OSHA Hazards: Irritant

- 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
Succinic acid: CAS number 110-15-6
Revision Date

- 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.

15.2. Chemical safety assessment

The chemical safety of this substance, succinic acid CAS 110-15-6, has been assessed by its supplier.

16. OTHER INFORMATION

16.1. Information about the revision

Version 1.0. April 28 2015. BioAmber Sarnia version.
Version 1.1. January 19 2016. Minor changes to Section 15.1.

16.2. Meanings of the abbreviations and acronyms used

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
CLP: classification, labelling and packaging
DSD: dangerous substances directive
DPD: dangerous preparations directive
EC number: European Commission number
IATA: International Air Transport Association
IMDG: international maritime dangerous goods code
PBT: persistent bioaccumulable toxic substances
UN number: United Nations number
UVCB: unknown, of variable composition, or of biological origin (products of complex and/or biological reactions)
VOC: volatile organic compounds
vPvB: very persistent and very bioaccumulable

16.3. Bibliographic references and data sources

Chemical Safety Report *Succinic acid*, ARD (2012).

16.4. Assessment methods for classifying mixtures

Not applicable

16.5. List of R phrases, hazard warnings, precautions recommended in section 3

Risk phrases (R phrases)

R41 Risk of serious damage to the eyes.

Hazard notices (H)
H318 Can cause serious damage to the eyes.

16.6. Recommendations for all relevant training being given to staff

-

The information contained in this file is based on our current state of knowledge and has been provided in accordance with the applicable European directives. This information is provided in order to give the characteristics of the product and to assist in applying safety instructions. However, this document does not constitute any warranty, express or implicit, regarding the properties of the product.

Appendix I - Overview of the exposure scenarios for succinic acid

ES number	Name of exposure scenario	IU	Manufacture/use/useful service life afterwards	Stage no. *)
1	Industrial manufacturing	0001	Manufacturing step [manufacture by microbial fermentation] - Used in closed batch processes	M-1
2	Industrial distribution	1001	- Transfer of the substance or preparation (filling/emptying) in or out of receptacles/large containers in dedicated systems	F-1
3	Industrial formulation	1002	Industrial formulation I, for non-food uses Formulation step [water treatment products] - Used in closed batch processes - Mixture - Transfer of the substance or preparation (filling/emptying) in or out of receptacles/large containers in dedicated systems	F-2
		2001	Final industrial use: [pH regulator, flocculating agent, precipitant, neutralisation agent, other non-specified]	IW-1
		2002	Final industrial use step [water treatment]	IW-2
		1003	Industrial formulation II, for non-food uses Formulation step [welding products] - Used in closed batch processes - Mixture - Transfer of the substance or preparation (filling/emptying) in or out of receptacles/large containers in dedicated systems - Transfer of the substance or preparation into small containers (dedicated filling line, including weighing)	F-3
		2003	Final industrial use step [welding products]	IW-3
		1004	Industrial formulation for other uses	F-4
4	inal industrial use: Polymerisation	2004	Final industrial use step [use as a monomer] - Batch use by other (synthesis) processes where there is a potential for exposure - Mixture	IW-4
5	inal industrial use: Intermediate	2005	Final industrial use step [intermediate in a formulation step] - Mixture	IW-5
		2006	Final industrial use step [esterification and other synthetic reactions] - Batch use by other (synthesis) processes where there is a potential for exposure	IW-6
		2007	Final industrial use step [hydrogenation] - Used in a closed process; exposure unlikely	IW-7
6	Final use by professionals and consumers: Fertilizer	3000	Use as fertilizer - Wide dispersive outdoor use of processing aids in open systems	PW-1

ES number	Name of exposure scenario	IU	Manufacture/use/useful service life afterwards	Stage no. *)
		4000	Use as fertilizer - Wide dispersive outdoor use of processing aids in open systems	C-1
7	Final use by professionals in washing and cleaning products, water softeners, cosmetics:	3001	Final use by professionals: - Wide dispersive indoor use of processing aids in open systems - Wide dispersive indoor use of reactive substances in open systems	PW-2
8	Final use by consumers in washing and cleaning products, water softeners:	4001	Final use by consumers: - Wide dispersive indoor use of processing aids in open systems - Wide dispersive indoor use of reactive substances in open systems	C-2

*) The nomenclature for the stage uses an abbreviation for the step in the lifecycle followed by a sequential number
Manufacture: M-#, Formulation: F-#, Industrial end use: IW-#, Professional end use: PW-#, Consumer end use: C-#, Service life (by workers in industrial settings): SL-IW-#, Service life (by professional workers): SL-PW-#, Service life (by consumers): SL-C-#.

Appendix II - Scope of the exposure assessment

Environment

No classification has been set and no hazards have been identified. Succinic acid does not bioaccumulate and is easily biodegradable. No secondary poisoning or risks to humans via the environment are therefore expected. Succinic acid is neither PBT nor vPvB. As a result, evaluation of environmental exposure is not required.

Staff

Exposure pathway and types of effects	Type of evaluation	Explanation/justification
Inhalation: Acute, local/topical	**Evaluation of the exposure and classification of the risk are not required**	The substance does not meet the criteria for classification. No hazards have been identified.
Inhalation: Acute, systemic	**Evaluation of the exposure and classification of the risk are not required**	The substance does not meet the criteria for classification. No hazards have been identified.
Inhalation: Long-term, local/topical	**Evaluation of the exposure and classification of the risk are not required**	The substance does not meet the criteria for classification. No hazards have been identified.
Inhalation: Long-term, systemic	**Evaluation of the exposure and classification of the risk are not required**	The substance does not meet the criteria for classification. No hazards have been identified.
Cutaneous: Acute, local/topical	**Classification of the qualitative risk for the eyes**	No information is available regarding the dose/response and/or the effect threshold. A hazard for the eyes but not for the skin has been noted.
Cutaneous: Acute, systemic	**Evaluation of the exposure and classification of the risk are not required**	The substance does not meet the criteria for classification. No hazards have been identified.
Cutaneous: Long-term, local/topical	**Evaluation of the exposure and classification of the risk are not required**	The substance does not meet the criteria for classification. No hazards have been identified. The danger for the eyes is covered by the category "Cutaneous: acute, topical/local".
Cutaneous: Long-term, systemic	**Evaluation of the exposure and classification of the risk are not required**	The substance does not meet the criteria for classification. No hazards have been identified.

Hazard level: moderate
Justification: the only noteworthy toxic effect is the potential for severe irritation of the eyes.

Consumer

No quantitative exposure assessment is possible for the only danger detected, namely severe eye irritation. Operational conditions and risk management measures are needed to prevent exposure:
Dust must be avoided where this could be produced when the processes are applied. Products should be handled in an open area. Safety precautions include the use of safety glasses when handling the product in a dusty environment. Manual handling in dusty areas should be avoided.

Appendix III - Exposure scenarios

1. INDUSTRIAL MANUFACTURING

1.1. Exposure scenario

IU 0001: Industrial manufacturing	
Sector in which it is used:	
Manufacture of food products	SU 4
Production of textiles, leather, fur	SU 5
Large-scale manufacture of bulk chemicals (including petrochemical products)	SU 8
Manufacture of fine chemicals	SU 9
Formulation [mixing] of preparations and/or repackaging (excluding alloys)	SU 10
Manufacture of plastic products, including compounding and conversion	SU 12
Environment:	
Manufacture of substances	ERC 1
Staff:	
Used in a closed process; exposure unlikely	PROC 1
Used in a closed continuous process, with occasional controlled exposure	PROC 2
Used in a closed batch process (synthesis or formulation)	PROC 3

1.2. Estimation of exposure for industrial manufacturing

1.2.1. Estimation of exposure for the environment

Not required.

1.2.2. Estimation of exposure for staff for the various PROCs

No quantitative exposure assessment is possible for the only danger detected, namely severe eye irritation. Operational conditions and risk management measures are needed to prevent exposure:

Operational conditions: Dust must be avoided where this could be produced when the processes are applied. Sufficient ventilation is the minimum requirement. A local ventilation system must be provided if dust is formed. All manual handling in a zone where dust is present must be minimised.

Personal protection: wear tight-fitting goggles

2. INDUSTRIAL DISTRIBUTION

2.1. Exposure scenario

IU 1001: Industrial distribution	
Sector in which it is used:	
Manufacture of food products	SU 4
Production of textiles, leather, fur	SU 5
Large-scale manufacture of bulk chemicals (including petrochemical products)	SU 8
Manufacture of fine chemicals	SU 9
Formulation [mixing] of preparations and/or repackaging (excluding alloys)	SU 10
Manufacture of plastic products, including compounding and conversion	SU 12
Distribution of electricity, steam, water and gas, and treatment of wastewater	SU 23
Environment:	
Other: not relevant	ERC 0
Staff:	
Transfer of the substance or preparation (filling/emptying) in or out of receptacles/large containers in dedicated systems	PROC 8a

Additional specifications: Repackaging of 2% of the 2000 tons per year for distribution purposes.

2.2. Estimation of exposure for industrial distribution

2.2.1. Estimation of exposure for the environment

Not required.

2.2.2. Estimation of exposure for staff for the various PROCs

No quantitative exposure assessment is possible for the only danger detected, namely severe eye irritation. Operational conditions and risk management measures are needed to prevent exposure:

Operational conditions: Dust must be avoided where this could be produced when the processes are applied. Sufficient ventilation is the minimum requirement. A local ventilation system must be provided if dust is formed. All manual handling in a zone where dust is present must be minimised.

Personal protection: wear tight-fitting goggles

3. INDUSTRIAL FORMULATION

3.1. Exposure scenario

IU 1002: Formulation step [water treatment products]	
Environment:	
Formulating preparations	ERC 2
Staff	
Used in a closed batch process (synthesis or formulation)	PROC 3
Mixing and batch processing for formulating preparations and other items (multiple levels and/or significant contact)	PROC 5
Transfer of the substance or preparation (filling/emptying) in or out of receptacles/large containers in dedicated systems	PROC 8a
IU 2001: Final industrial use step: [pH regulator, flocculating agent, precipitant, neutralisation agent, other non-specified]	
Market sector:	
Products such as pH regulators, flocculating agents, precipitants, neutralising agents	PC 20
Sector in which it is used:	
Distribution of electricity, steam, water and gas, and treatment of wastewater	SU 23
Environment:	
Industrial use as auxiliary reagents in manufacture	ERC 6b
IU 2002: Final industrial use step: [Water treatment]	
Market sector:	
Water treatment products	PC 37
Sector in which it is used:	
Distribution of electricity, steam, water and gas, and treatment of wastewater	SU 23
Environment:	
Industrial use as auxiliary reagents in manufacture	ERC 6b
IU 1003: Formulation step [welding products]	
Environment:	
Formulating preparations	ERC 2
Staff:	
Used in a closed batch process (synthesis or formulation)	PROC 3
Mixing and batch processing for formulating preparations and other items (multiple levels and/or significant contact)	PROC 5

Transfer of the substance or preparation (filling/emptying) in or out of receptacles/large containers in dedicated systems	PROC 8a
Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	PROC 9
IU 2003: Final industrial use step: [Welding products]	
Market sector:	
Welding products (with coatings or flux cores), flux products	PC 38
Sector in which it is used:	
Production of textiles, leather, fur	SU 5
Formulation [mixing] of preparations and/or repackaging (excluding alloys)	SU 10
Environment:	
Industrial use of manufacturing aids in processes and products, not becoming an integral part of the items	ERC 4
IU 2003: Final industrial use step: [other products]	
Market sector:	
Washing and cleaning products (including solvent-based products)	PC 35
Water softeners	PC 36
Cosmetics, personal care products	PC 39
Worker:	
Used in a closed continuous process with occasional controlled exposure	PROC 2
Used in a closed batch process (synthesis or formulation)	PROC 3
Used in batch and other processes (synthesis) associated with potential exposure	PROC 4
Mixing and batch processing for formulating preparations and other items (multiple levels and/or significant contact)	PROC 5
Transfer of substance or preparation (filling/emptying) in or out of receptacles/large containers in dedicated systems	PROC 8a
Transfer of substance or preparation (filling/emptying) in or out of receptacles/large containers in specialized facilities	PROC 8b
Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	PROC 9
Environment:	
Formulation of preparations	ERC 2

3.2. Estimation of exposure for industrial formulations

3.2.1. Estimation of exposure for the environment

Not required.

3.2.2. Estimation of exposure for staff for the various PROCs

No quantitative exposure assessment is possible for the only danger detected, namely severe eye irritation. Operational conditions and risk management measures are needed to prevent exposure:

Operational conditions: Dust must be avoided where this could be produced when the processes are applied. Sufficient ventilation is the minimum requirement. A local ventilation system must be provided if dust is formed. All manual handling in a zone where dust is present must be minimised.

Personal protection: wear tight-fitting goggles

4. FINAL INDUSTRIAL USE POLYMERISATION

4.1. Exposure scenario

IU 2004: Final industrial use [use as a monomer]	
Sector in which it is used:	
Manufacture of plastic products, including compounding and conversion	SU 12
Environment:	
Industrial use of monomers in polymerisation processes	ERC 6c
Staff:	
Batch use by other (synthesis) processes where there is a potential for exposure	PROC 4
Mixing and batch processing for formulating preparations and other items (multiple levels and/or significant contact)	PROC 5

4.2. Estimation of exposure for the final industrial use [use as a monomer]

4.2.1. Estimation of exposure for the environment

Not required.

4.2.2. Estimation of exposure for staff for the various PROCs

No quantitative exposure assessment is possible for the only danger detected, namely severe eye irritation. Operational conditions and risk management measures are needed to prevent exposure:

Operational conditions: Dust must be avoided where this could be produced when the processes are applied. Sufficient ventilation is the minimum requirement. A local ventilation system must be provided if dust is formed. All manual handling in a zone where dust is present must be minimised.

Personal protection: wear tight-fitting goggles

5. FINAL INDUSTRIAL USE: INTERMEDIATE

5.1. Exposure scenario

IU 2005: Final industrial use step [intermediate in a formulation step]	
Sector in which it is used:	
Large-scale manufacture of bulk chemicals (including petrochemical products)	SU 8
Environment:	
Industrial use resulting in the manufacture of another substances (use of intermediates)	ERC 6a
Staff:	
Mixing and batch processing for formulating preparations and other items (multiple levels and/or significant contact)	PROC 5
IU 2006: Final industrial use step [esterification and other synthetic reactions]	
Sector in which it is used:	
Large-scale manufacture of bulk chemicals (including petrochemical products)	SU 8
Manufacture of fine chemicals	SU 9
Environment:	
Industrial use resulting in the manufacture of another substances (use of intermediates)	ERC 6a
Staff:	
Batch use by other (synthesis) processes where there is a potential for exposure	PROC 4
IU 2007: Final industrial use step [hydrogenation]	
Sector in which it is used:	
Large-scale manufacture of bulk chemicals (including petrochemical products)	SU 8
Environment:	
Industrial use resulting in the manufacture of another substances (use of intermediates)	ERC 6a
Staff:	
Used in a closed process; exposure unlikely	PROC 1

5.2. Estimation of exposure for the final industrial use [use as an intermediate]

5.2.1. Estimation of exposure for the environment

Not required.

5.2.2. Estimation of exposure for staff for the various PROCs

No quantitative exposure assessment is possible for the only danger detected, namely severe eye irritation. Operational conditions and risk management measures are needed to prevent exposure:

Operational conditions: Dust must be avoided where this could be produced when the processes are applied. Sufficient ventilation is the minimum requirement. A local ventilation system must be provided if dust is formed. All manual handling in a zone where dust is present must be minimised.

Personal protection: wear tight-fitting goggles.

6. FINAL USE BY PROFESSIONALS AND CONSUMERS: FERTILIZER

6.1. Exposure Scenario

IU 3000: Professional use as fertilizer	
Market sector:	
Fertilizers	PC 12
Sector in which it is used:	
Professional uses: Public domain (administration, education, live entertainment, services, artisans)	SU 22
Environment:	
Wide dispersive outdoor use of processing aids in open systems	ERC 8d
IU 4000: Consumer use as a fertilizer	
Market sector:	
Fertilizers	PC 12
Sector in which it is used:	
Consumers: Private households (= general public = consumers)	SU 21
Environment:	
Wide dispersive outdoor use of processing aids in open systems	ERC 8d

6.2. Estimation of exposure for the final use as fertilizers

6.2.1. Estimation of exposure for the environment

Not required.

6.2.2 Estimation of exposure for professional users and consumers

Professional users (public domain): No quantitative exposure assessment is possible for the only danger detected, namely severe eye irritation. Operational conditions and risk management measures are needed to prevent exposure:

Dust must be avoided where this could be produced when the processes are applied. Products should be handled in an open area. Safety precautions include the use of a respirator mask and sealed safety glasses when handling the product in a dusty environment. Manual handling in dusty areas should be avoided.

Consumers (private households): No quantitative exposure assessment is possible for the only danger detected, namely severe eye irritation. Personal protection is necessary to reduce or prevent exposure:

Dust must be avoided where this could be produced when the processes are applied. Products should be handled in an open area. Safety precautions include the use of safety glasses when handling the product in a dusty environment. Manual handling in dusty areas should be avoided.

7. FINAL USE BY PROFESSIONALS: WASHING AND CLEANING PRODUCTS, WATER SOFTENERS, COSMETICS:

7.1. Exposure scenario

IU 3001: Use by professionals in washing and cleaning products, water softeners, cosmetics	
Market sector:	
Washing and cleaning products (including solvent-based products)	PC 35
Water softeners	PC 36
Cosmetics, personal care products	PC 39
Sector in which it is used:	
Professional uses: Public domain (administration, education, live entertainment, services, artisans)	SU 22
Environment:	
Wide dispersive indoor use of processing aids in open systems	ERC 8a
Wide dispersive indoor use of reactive substances in open systems	ERC 8b

7.2. Estimation of exposure for final use in washing and cleaning products, water softeners, cosmetics

7.2.1. Estimation of exposure for the environment

Not required.

7.2.2 Estimation of exposure for professional users and consumers

Professional users (public domain): No quantitative exposure assessment is possible for the only danger detected, namely severe eye irritation. Operational conditions and risk management measures are needed to prevent exposure:

Dust must be avoided where this could be produced when the processes are applied. Products should be handled in an open area. Safety precautions include the use of a respirator mask and sealed safety glasses when handling the product in a dusty environment. Manual handling in dusty areas should be avoided.

8. FINAL USE BY CONSUMERS: WASHING AND CLEANING PRODUCTS, WATER SOFTENERS:

8.1. Exposure scenario

IU 3001: Use by consumers in washing and cleaning products, water softeners	
Market sector:	
Washing and cleaning products (including solvent-based products)	PC 35
Water softeners	PC 36
Sector in which it is used:	
Consumers: Private households (= general public = consumers)	SU 21
Environment:	
Wide dispersive indoor use of processing aids in open systems	ERC 8a
Wide dispersive indoor use of reactive substances in open systems	ERC 8b

8.2. Estimation of exposure for final use in washing and cleaning products, water softeners

8.2.1. Estimation of exposure for the environment

Not required.

8.2.2 Estimation of exposure for professional users and consumers

Consumers (private households): No quantitative exposure assessment is possible for the only danger detected, namely severe eye irritation. Personal protection is necessary to reduce or prevent exposure:

Dust must be avoided where this could be produced when the processes are applied. Products should be handled in an open area. Safety precautions include the use of safety glasses when handling the product in a dusty environment. Manual handling in dusty areas should be avoided.