

Chlorendic Anhydride PE1 + SG

Material number C002

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

1.1 Product identifier

Trade name: Chlorendic Anhydride PE1+ SG
REACH registration No.: 01-2119911956-30-0000
CAS-Number: 115-27-5
EC-number: 204-077-3
Index-number: 607-101-00-4

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

1.2.1 Relevant identified uses:

Industrial applications: Hardener for epoxy resins, paints, and coatings.
Other non-specified industry: Flame retardant in unsaturated polyester resins.

1. Receipt and storage of raw materials
SU 10; PROC 1, 3, 8b; PC 32; ERC 2
2. Blending or dissolving or dispersion
SU 10; PROC 2, 4, 5; PC 32; AC 32; ERC 2
3. Filtering and filling
SU 10; PROC 8a, 9; PC 32; ERC 2
4. Waste management
SU 23; PROC 3, 8b; ERC 2
5. Use in closed batch process (synthesis or formulation)
SU 3; PROC 3; PC 32; ERC 2
6. Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
SU 3; PROC 5; PC 32
7. Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC 8b, 9; PC 32; ERC 2
8. Research and development
PROC 15; PC 32; ERC 2

1.2.2 Uses advised against:

No specific uses advised against have been identified.

1.3 Details of the supplier of the safety data sheet

Company name: Velsicol Chemical Ireland Ltd
Charter House
Street/POB-No.: 5 Pembroke Row
Postal Code, city: Dublin 2
Republic of Ireland
WWW: www.velsicol.com
Telephone: +353 1 477 3143
Telefax: +353 1 402 9587
Dept. responsible for information: sfriedman@velsicol.com

1.4 Emergency telephone number

Telephone: +49 51 92 98970 (08:00– 17:00 CET) or
CHEMTREC, Telephone: +1 703 527 3887 (24h; from USA: +1 800 424 9300)

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SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

2.1.1 Classification according to EC regulation 1272/2008 (CLP)

Skin Irrit. 2; H315	Causes skin irritation.
Eye Irrit. 2; H319	Causes serious eye irritation.
Skin Sens. 1; H317	May cause an allergic skin reaction.
STOT SE 3; H335	May cause respiratory irritation.
Chron. 3; H412	Harmful to aquatic life with long lasting effects.

2.2 Label elements

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

Hazard pictograms



Signal word: **Warning**

Hazard statements:

- H315: Causes skin irritation.
- H317: May cause an allergic skin reaction.
- H319: Causes serious eye irritation.
- H335: May cause respiratory irritation
- H412: Harmful to aquatic life with long lasting effects.

Precautionary statements:

- P261: Avoid breathing dust.
- P273: Avoid release to the environment.
- P280: Wear protective gloves/protective clothing/eye protection/face protection.
- P302 + P352: IF ON SKIN: Wash with plenty of soap and water.
- P304 + P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Special labelling

- EUH 401: To avoid risks to human health and the environment, comply with the instructions for use.

2.3 Other hazards

No risks worthy of mention.

SECTION 3: Composition / information on ingredients

3.1 Substances

Chemical characterization: C9 H2 Cl6 O3
Chemical name: 1,4,5,6,7,7-Hexachlorobicyclo [2,2,1] hept-5-ene-2,3-dicarboxylic anhydride
CAS-Number: 115-27-5
EC-number: 204-077-3
Index-number: 607-101-00-4
Purity: >95%

Specific Concentration limits, M-Factors, Acute Toxicity Estimates (ATE)

Eye Irrit. 2; H319: C ≥ 1 %
STOT SE 3; H335: C ≥ 1 %
Skin Irrit. 2; H315: C ≥ 1 %

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Hazardous impurities

Chemical Name	Common name and synonyms	EC number	% by Weight
Maleic anhydride	2,5-Furandione	203-571-6	<1.0
Chlorobenzene	Benzene, chloro-	203-628-5	<5.0

3.2. Mixtures

Not a mixture

SECTION 4: First aid measures

4.1 Description of first aid measures

4.1.1 General information:

Inhalation and skin contact are expected to be the primary routes of occupational exposure to chlorendic anhydride. This material is irritating to the eyes, skin and respiratory tract.

4.1.2 Following inhalation:

Remove to under fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

4.1.3 Following skin contact:

Immediately wash skin with soap and plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Destroy contaminated shoes.

4.1.4 Following eye contact:

Immediately flush with plenty of water for at least 15 minutes. Get medical attention immediately.

4.1.5 Following ingestion:

Get medical attention. Inducing vomiting as directed by medical personnel. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

4.1.6 Self-protection of the first aider:

Wear protective gloves/protective clothing/eye protection/face protection. Avoid release to the environment. Do not get in eyes, on skin, or on clothing. Contaminated work clothing should not be allowed out of the workplace. Get medical attention immediately.

4.1.7 Notes for the doctor:

Not available.

4.2 Most important symptoms and effects, both acute and delayed

Severely irritate to eyes. Causes skin irritation. May cause respiratory irritation.

4.3 Indication of any immediate medical attention and special treatment needed

Treat symptomatically

SECTION 5: Firefighting measures

5.1 Extinguishing media

- Flammability Properties: Non-flammable.
- Suitable extinguishing media: Extinguishing is to be in accordance with the surrounding fire.
- Unsuitable extinguishing media: Not applicable.

5.2 Special hazards arising from the substance or mixture

Fine dust.

This product contains up to 5% occluded Chlorobenzene, which can present a fire hazard if sufficient oxygen and a source of ignition is present.

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5.3 Advice for firefighters

- Special protective equipment for firefighters:
Advice for fire-fighters: Wear self-contained breathing apparatus, protective clothing and rubber boots.
- Additional information:
Non-flammable; No explosion. Avoid breathing dust.
Do not allow fire water to penetrate into surface or ground water.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use suitable personal protective equipment to protect skin and eyes. Ventilate affected area.
Avoid generation of dust.

6.2 Environmental precautions

Do not allow to enter into ground-water, surface water or drains.
In case of entry into waterways, soil or drains, inform the responsible authorities.

6.3 Methods and material for containment and cleaning up

Stop leak if safe to do so.
Collect in closed and suitable containers for disposal. Dispose of this material and its container to hazardous or special waste collection point.
Avoid generation of dust.
Remove residual product with water and detergent.

6.4 Reference to other sections

Refer additionally to chapter 8 and 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

7.1.1 Recommendations for safe handling

- Protective measures: Do not handle until all safety precautions have been read and understood.
Wear suitable protective clothing, gloves and eye/face protection.
- Protective measures at Dust formation: Provide good ventilation. Do not breathe dust.
- Environmental measures: Avoid release to the environment.

7.1.2 Advices on general occupational hygiene

Avoid contact with skin and eyes. Change contaminated clothing. When using do not eat, drink or smoke.
Wash hands before breaks and after work.

7.2 Conditions for safe storage, including any incompatibilities

7.2.1 Requirements for storerooms and containers

Store at room temperature in a dry and well ventilated area. Keep container tightly closed. Keep away from food, drink and animal feeding stuffs.

This product contains up to 5% occluded Chlorobenzene, which can present a fire hazard if sufficient oxygen and a source of ignition is present. Ground containers and equipment to avoid static charge accumulation and/or use an inert atmosphere to prevent combustion.

7.2.2 Storage Class

Protect from humidity and water.

7.3 Specific end use(s)

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End use name	Substance supplied to that use
Receipt and storage of raw materials	as such (substance itself)
Blending / dissolving of dispersion	as such (substance itself)
Filtering and filling	in a mixture
Waste management	in a mixture
Use in closed batch process	as such (substance itself)
Mixing or blending batches	as such (substance itself)
Transfer of substance	in a mixture
Research and development.	as such (substance itself)

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

8.1.1 The national occupational exposure limit values

Chlorendic Anhydride:

contains no occupational exposure limit values.

Chlorobenzene:

Exposure Limits: ACGIH TWA: 10 ppm or 46 mg/m³. OSHA PEL: 75ppm or 350 mg/m³

Maleic anhydride:

United Kingdom, WEL - TWA: 1 mg/m³, WEL - STEL: 3 mg/m³

United States: TWA: 0.25 ppm from OSHA/NIOSH; TWA: 0.25 ppm from ACGIH.

8.1.2 Recommended monitoring procedures

N/A

8.1.3 Air contaminants occupational exposure limit values

N/A

8.1.4 The relevant DNELs and PNECs

DN(M)ELs for workers

Exposure pattern	Route	DNEL / DMEL	(Corrected) Dose descriptor
Acute - systemic effects	Dermal	43 mg/kg bw/day	NOAEL: 1,290 mg/kg bw/day (based on AF of 30)
Acute - systemic effects	Inhalation	299 mg/m ³	NOAEC: 8,970 mg/m ³ (based on AF of 30)
Acute - local effects	Dermal	1 mg/cm ²	LOAEL: 50 mg/cm ² (based on AF of 50)
Acute - local effects	Inhalation	299 mg/m ³	NOAEC: 8,970 mg/m ³ (based on AF of 30)
Long-term - systemic effects	Dermal	3.7 mg/kg bw/day	NOAEL: 1,110.0 mg/kg bw/day (based on AF of 300)
Long-term - systemic effects	Inhalation	15 mg/m ³	NOAEC: 4,500 mg/m ³ (based on AF of 300)
Long-term - local effects	Dermal	0.56 mg/cm ²	NOAEL: 100.80 mg/cm ² (based on AF of 180)
Long-term - local effects	Inhalation	33.23 mg/m ³	NOAEC: 9,969.00 mg/m ³ (based on AF of 300)

DN(M)ELs for the general population

Exposure pattern	Route	DNEL / DMEL	(Corrected) Dose descriptor
Acute - systemic effects	Dermal	21 mg/kg bw/day	NOAEL: 1,260 mg/kg bw/day (based on AF of 60)
Acute - systemic effects	Inhalation	149 mg/m ³	NOAEC: 8,940 mg/m ³ (based on AF of 60)
Acute - systemic effects	Oral	21 mg/kg bw/day	NOAEL: 1,260 mg/kg bw/day (based on AF of 60)
Acute - local effects	Dermal	0.5 mg/cm ²	LOAEL: 50.0 mg/cm ² (based on AF of 100)
Acute - local effects	Inhalation	0.042 mg/m ³	NOAEC: 50.400 mg/m ³ (based on AF of 1200)
Long-term - systemic effects	Dermal	3 mg/kg bw/day	NOAEL: 1,080 mg/kg bw/day (based on AF of 360)

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Long-term - systemic effects	Inhalation	12 mg/m ³	NOAEC: 4,320 mg/m ³ (based on AF of 360)
Long-term - systemic effects	Oral	1.1 mg/kg bw/day	NOAEL: 396.0 mg/kg bw/day (based on AF of 360)
Long-term - local effects	Dermal	0.28 mg/cm ²	NOAEL: 100.80 mg/cm ² (based on AF of 360)
Long-term - local effects	Inhalation	16.62 mg/m ³	NOAEL: 9,972.00 mg/m ³ (based on AF of 600)

PNECs

Environmental protection target	PNEC	Remark
Fresh water	0.097 mg/L	Extrapolation method: assessment factor The LC50 from Acute toxicity to Algae, 97.2 mg/l, was used. This is the worst-case scenario for aquatic toxicity.
Marine water	0.0097 mg/L	
Intermittent release	0.97 mg/L	
Sediment (fresh water)	0.097 mg/kg dw	
Sediment (marine water)	0.0097 mg/kg dw	
Soil (Terrestrial)	0.106 mg/kg dw	Extrapolation method: partition coefficient
Food chain (Oral, mammals)	2.51 mg/kg food	The endpoint used was 90 day sub-acute oral toxicity to rats which gave a result of 226 mg/kg bw/day and has an assessment factor of 90.
Sewage treatment	16.23 mg/L	Extrapolation method: assessment factor

DN(M)EL: Derived No(Minimal) Effect Level; NOAEL(C): No-observed-adverse-effect level (concentration), PNEC: Predicted No-Effect Concentration; AF: Assessment Factor

8.2 Exposure controls

8.2.1 Appropriate engineering controls:

Provide ventilation if necessary to minimize exposure. If practical use local mechanical exhaust ventilation at sources of air contamination such as open process equipment.

8.2.2 Personal protective measures:

Do not eat, drink, or smoke whilst working. Keep away from foodstuffs, beverages and feed. Remove all contaminated clothing. Wash hands before breaks and at the end of work.

Respiratory protection

A full-face piece respirator with dual organic vapour and particulate matter cartridge is recommended.

Hand Protection

Chemical resistant coveralls, gloves and boot covers. If gloves are damaged during use, remove immediately and wash hands before replacing with new gloves.

Eye and face protection

Safety glasses should be worn when handling this substance.

Skin protection

Aprons or coveralls are recommended. These should be changed after use or if contaminated. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

8.2.3 Environmental exposure controls:

Avoid release to the environment.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state: Solid, Crystalline
 Colour: White
 Odour: Strong odour of aromatic hydrocarbons
 Odour threshold: Unknown

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pH:	Not available
Melting point/ range:	235 - 239 °C
Boiling point/range:	266.5 - 322 °C
Flash point:	Not applicable
Flammability:	Non-flammable
Auto-ignition temperature:	Not applicable
Explosive properties:	Not explosive
Vapour pressure:	at 25 °C: 0,00268 Pa
Vapour density:	no data available
Density:	at 20 °C: 1,76 g/cm ³ (Pyknometer)
Solubility:	Easily soluble in: Acetone; Soluble in: Methanol, diethyl ether, n-octanol
Water solubility:	at 20 °C: <= 0,0025 g/L
Partition coefficient n-octanol/water:	at 25 °C: -1,59 log Kow (Chlorendic acid)
Appreciable bio-accumulation is not to be expected (log Po/w 1-3).	
Thermal decomposition:	no data available
Viscosity, dynamic:	no data available
Viscosity, kinematic:	not applicable
Explosive properties:	no data available
Oxidizing characteristics:	no data available
Dissociation Constant:	Study not undertaken as Chlorendic Anhydride readily hydrolyses
Particle size distribution (median value):	0,1% w/w < 10 µm

9.2 Other information

Molecular weight:	approx. 371 g/mol
Evaporation rate:	Not applicable
Decomposition temperature:	Not available
Oxidising properties:	Not oxidising
Vapour density:	not available
Surface tension:	72 mN/m (20°C, 450 mg/L aqueous solution). The product hydrolyses quickly in the presence of water to: Chlorendic acid

SECTION 10: Stability and reactivity

10.1 Reactivity

Not a reactive substance and no reactive hazards are expected.

No hazardous reaction when handled and stored according to provisions.

10.2 Chemical stability

Product is stable under normal storage conditions.

The product hydrolyses quickly in the presence of water to: Chlorendic acid (CA# 115-28-6)

10.3 Possibility of hazardous reactions

No dangerous reactions are known.

10.4 Conditions to avoid

Protect from moisture contamination. Protect from heat and direct sunlight.

10.5 Incompatible materials

Oxidizing or reducing agents, strong bases, acids.

10.6 Hazardous decomposition products

No decomposition when used properly.

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SECTION 11: Toxicological information

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008

115-27-5, Chlorendic Anhydride:

(a) Acute toxicity

This substance is not classified as acute toxic for all exposure route listed below:

Acute Toxicity	Effect Dos /Concentration
Acute Oral Toxicity	LD50: 2562 mg/kg bw (male) LD50: 2130 mg/kg bw (female)
Acute dermal toxicity	LD50: 10000 - 20000 mg/kg bw
Acute inhalative toxicity (dust/mist)	LC50: > 203 mg/l

(b) Skin corrosion/irritation

Causes skin irritation

(c) Serious eye damage/irritation

Causes serious eye irritation

Irritation parameter	Basis	Time point	Score	Max. score	Reversibility	Remarks
overall irritation score	mean	14 days	16.4	17.3	no data	Rabbit

(d) Respiratory/skin sensitisation

May cause an allergic skin reaction

(e) Germ cell mutagenicity

Chlorendic Anhydride is not classified as genetically toxic as all study results are negative.

(f) Carcinogenicity

Not classified as carcinogenic.

Chlorendic anhydride will rapidly hydrolyse to chlorendic acid in the presence of water.

International Agency for Research on Cancer (IARC) has given chlorendic acid an overall evaluation of 2B (possibly carcinogenic).

(g) Reproductive toxicity

Chlorendic anhydride is not classified as toxic to reproduction as negative results were obtained in the reproductive and spermatogenetic studies in animals.

Adverse effects on sexual function and fertility:

Species	Result /Evaluation
Mouse	NOEL (Fetal mortality): > 223 mg/kg bw/day (actual dose received)

Adverse effects on developmental toxicity:

Species	Result / Evaluation
Rats	NOEL: 400 mg/kg bw/day (actual dose received); NOEL (maternal toxicity): 100 mg/kg bw/day (nominal)

(h) STOT-single exposure

May cause respiratory irritation

(i) STOT-repeated exposure

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Not classified

(j) Aspiration hazard

This substance is a solid.

108-31-6, Maleic anhydride in RTECS (#ON3675000):

Dermal, guinea pig: LD50 = >20 gm/kg;

Draize test, rabbit, eye: 1% Severe;

Oral, mouse: LD50 = 465 mg/kg;

Oral, rabbit: LD50 = 875 mg/kg;

Oral, rat: LD50 = 400 mg/kg;

Skin, rabbit: LD50 = 2620 mg/kg.

108-90-7, Chlorobenzene:

Oral, LD50, Rat: 1110 mg/kg;

Oral, LD50, Mouse: 2300 mg/kg.

11.2 Information on other hazards

No data available.

SECTION 12: Ecological information

12.1 Toxicity

Aquatic toxicity: Aquatic Chronic 3, H412: Harmful to aquatic life with long lasting effects.

Acute (short-term) fish toxicity:

- LC50 Oncorhynchus mykiss: 422,7 mg/L/96h (EU Method C. 1)

- LC50 Lepomis macrochirus (Bluegill): 422,7 mg/L/96h (EU Method C.1)

- LC50 (freshwater fish): 422.7 mg/L

Acute Daphnia toxicity:

- EC50 Daphnia magna (Big water flea): 110,7 mg/L/48h (EU Method C.2)

Acute (short-term) toxicity to crustacea:

- EC50/LC50: 110,7 mg/L/48h

Algae toxicity (acute):

- EC50/LC50: 97.2 mg/L/72h (Algal Inhibition test)

- EC10/LC10 or NOEC: 48,4 mg/L/72h (Algal Inhibition test)

Algae toxicity (chronic):

- EC50: >97, 2mg/L

Predicted No Effect Concentration (PNEC)							
Fresh water	Marine water	Intermittent release	Sediment (fresh water)	Sediment (marine water)	Soil (Terrestrial)	STP (sewage treatment plant)	Oral (mammals)
0.097 mg/L	0.0097 mg/L	0.97 mg/L	0.097 mg/kg dw	0.0097 mg/kg dw	0.106 mg/kg dw	16.23 mg/L	2.51 mg/kg food

12.2 Persistence and degradability

Abiotic degradation:

- Chlorendic Anhydride hydrolyzed with water (Product: Chlorendic acid).

- Water solubility (Chlorendic acid): 0,499 mg/L.

Biodegradation:

- Chlorendic Anhydride: Not bio-degradable.

- Chlorendic acid: Potentially biologically degradable.

12.3 Bioaccumulative potential

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Partition coefficient n-octanol/water: 1,39 log Kow; No accumulation
Partition coefficient n-octanol/water: at 25 °C: -1,59 log Kow (Chlorendic acid)
Appreciable bio-accumulation is not to be expected (log Po/w 1-3).

12.4 Mobility in soil

Chlorendic Anhydride hydrolyzed with water (Product: Chlorendic acid) log Koc = 0,92 (Chlorendic acid)

12.5 Results of PBT and vPvB assessment

This substance does not meet the PBT/vPvB criteria of REACH, annex XIII.

12.6 Other adverse effects

General information: Do not allow to penetrate into soil, waterbodies or drains.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste key number: 07 01 99 = Wastes from the manufacture, formulation, supply and use (MFSU) of basic organic chemicals: Wastes not otherwise specified
MFSU = manufacture, formulation, supply and use

Recommendation: Ensure all waste water is collected and treated via a waste water treatment plant.
Dispose of contents/container in accordance with local/regional/national/international regulation.

Contaminated packaging

Recommendation: Dispose of waste in accordance with local/regional/national/international regulation.

SECTION 14: Transport information

14.1 UN number

Not applicable

14.2 UN proper shipping name

ADR/RID, IMDG, IATA: Not restricted

14.3 Transport hazard class(es)

Not applicable

14.4 Packing group

Not applicable

14.5 Environmental hazards

Marine pollutant - IMDG: No

14.6 Special precautions for user

No dangerous good in sense of these transport regulations.

14.7 Maritime transport in bulk according to IMO instruments

No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations - EC member states

Not known.

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National regulations - USA

TSCA Inventory: listed, active

TSCA HPVC: not listed

NFPA Hazard Rating:

Health: 3 (Serious), Fire: 0 (Minimal), Reactivity: 0 (Minimal)

HMIS Version III Rating:

Health: 3 (Serious) - Chronic effects, Flammability: 0 (Minimal), Physical Hazard: 0 (Minimal)

Personal Protection: X = Consult your supervisor

15.2 Chemical Safety Assessment

For this substance a chemical safety assessment has been carried out.

SECTION 16: Other information

16.1 Indication of changes

2011-08-23, Section 2, 16

2017-09-20, Section 2, 11, and 16:

Delete H373, STOT SE 3, add H335, STOT SE 3

Delete DSD Classification and Labeling in sections 2 and 16

2019-03-27, updated annex I, II and III

2019-04-12 Major update: change format on most sections of SDS.

2022-11-04, Revision SDS according to COMMISSION REGULATION (EU) 2020/878

2023-01-23, Review and updated Section 2.2 and 16.3

16.2 Key literature references and sources for data

Dossier and Chemical Safety Report (CSR) submitted to ECHA under REACH

EC-REGULATIONS 1907/2006 (REACH), 1272/2008 (CLP), 2015/830 & 2020/878

Hazard Communication Standard (HCS)(29 CFR 1910.1200(g)) and Appendix D

Hazardous Substance Data Bank (HSDB), National library of Medicine, #2920

Product Data Sheet and SDS information from manufacturer.

For abbreviations and acronyms, see: ECHA Guidance on information requirements and chemical safety assessment, chapter R.20 (Table of terms and abbreviations).

16.3 Classification and procedure used to derive the classification for mixtures according to Regulation (EC) 1272/2008 [CLP]

Not a mixture.

16.4 List of relevant hazard statements and/or precautionary statements which are not written out in full under Sections 2 to 15

Precautionary statements:

P264: Wash contaminated skin thoroughly after handling.

P271: Use only outdoors or in a well-ventilated area.

P272: Contaminated work clothing should not be allowed out of the workplace.

P337 + P313: If eye irritation persists: Get medical advice/attention.

P332 + P313: If skin irritation occurs: Get medical advice/attention.

P362: Take off contaminated clothing and wash before reuse.

P312: Call a POISON CENTER or doctor/physician if you feel unwell.

P403+P233: Store in a well-ventilated place. Keep container tightly closed.

P405: Store locked up.

P501: Dispose of contents/container in accordance with local/regional/national/international regulation

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16.5 Contact Information

<p>SDS or Regulatory information, contact: Dawei Li Velsicol Chemical LLC 1199 Warford Street Memphis, TN 38108 Phone: +1 901 323 6226, ext. 124 Fax: +1 901 324 5897 dli@velsicol.com</p>	<p>Technical or Product Support Information, contact: Sherman Friedman Velsicol Chemical LLC 10400 W. Higgins Road Rosemont, IL 60018 U.S.A. Phone: +1 847 635 3486 Fax: +1 847 298 9018 Email: sfriedman@velsicol.com</p>
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16.6 Further information: Notice to Reader

The information in this data sheet has been established to our best knowledge and was up-to-date at time of revision.

It does not represent a guarantee for the properties of the product described in terms of the legal warranty regulations.

Annex to extended safety data sheet (eSDS) of Chlorendic anhydride

Annex I. Identified Uses (IU) of Chlorendic anhydride

IU number	Identified Use (IU) name	Substance supplied to that use	Use descriptors
1	Receipt and storage of raw materials	as such (substance itself)	<p>Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>Market sector by type of chemical product: PC 32: Polymer preparations and compounds</p> <p>Environmental release category (ERC): ERC 2: Formulation of preparations ERC 6d: Manufacture of uncured polyester resin</p> <p>Sector of end use (SU): SU 10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys)</p> <p>Subsequent service life relevant for that use?: no</p> <p>Article category related to subsequent service life (AC): AC 0: Other: Not applicable</p>
2	Blending / dissolving of dispersion	as such (substance itself)	<p>Process category (PROC): PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)</p> <p>Market sector by type of chemical product : PC 32: Polymer preparations and compounds</p> <p>Environmental release category (ERC):</p>

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			<p>ERC 2: Formulation of preparations ERC 6d: Manufacture of uncured polyester resin</p> <p>Sector of end use (SU): SU 10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys)</p> <p>Subsequent service life relevant for that use?: no</p> <p>Article category related to subsequent service life (AC): AC 0: Other: Not applicable AC 32: Scented eraser</p>
3	Filtering and filling	in a mixture	<p>Process category (PROC): PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p> <p>Market sector by type of chemical product: PC 32: Polymer preparations and compounds</p> <p>Environmental release category (ERC): ERC 2: Formulation of preparations ERC 6d: Manufacture of uncured polyester resin</p> <p>Sector of end use (SU): SU 10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys)</p> <p>Subsequent service life relevant for that use?: no</p> <p>Article category related to subsequent service life (AC): AC 0: Other: Not applicable</p>
4	Waste management	in a mixture	<p>Process category (PROC): PROC 3: Use in closed batch process (synthesis or formulation) PROC 8b: Transfer of substance or preparation (charging /discharging) from/to vessels/large containers at dedicated facilities</p> <p>Market sector by type of chemical product: PC 0: Other: Not applicable</p> <p>Environmental release category (ERC): ERC 2: Formulation of preparations ERC 6d: Manufacture of uncured polyester resin</p> <p>Sector of end use (SU): SU 23: Electricity, steam, gas water supply and sewage treatment</p> <p>Subsequent service life relevant for that use?: no</p> <p>Article category related to subsequent service life (AC): AC 0: Other: Not applicable</p>
5	Use in closed batch process	as such (substance itself)	<p>Process category (PROC): PROC 3: Use in closed batch process (synthesis or formulation)</p> <p>Market sector by type of chemical product: PC 32: Polymer preparations and compounds</p>

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			<p>Environmental release category (ERC): ERC 2: Formulation of preparations ERC 6d: Manufacture of uncured polyester resin</p> <p>Sector of end use (SU): SU 0: Other: SU 3: Industrial uses</p> <p>Subsequent service life relevant for that use?: no</p> <p>Article category related to subsequent service life (AC): AC 0: Other: Not applicable</p>
6	Mixing or blending batches	as such (substance itself)	<p>Process category (PROC): PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)</p> <p>Market sector by type of chemical product: PC 32: Polymer preparations and compounds</p> <p>Environmental release category (ERC): ERC 2: Formulation of preparations ERC 6d: Manufacture of uncured polyester resin</p> <p>Sector of end use (SU): SU 0: Other: SU 3: Industrial uses</p> <p>Subsequent service life relevant for that use?: no</p> <p>Article category related to subsequent service life (AC): AC 0: Other: Not applicable</p>
7	Transfer of substance	in a mixture	<p>Process category (PROC): PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p> <p>Market sector by type of chemical product: PC 32: Polymer preparations and compounds</p> <p>Environmental release category (ERC): ERC 2: Formulation of preparations ERC 6d: Manufacture of uncured polyester resin</p> <p>Sector of end use (SU): SU 0: Other: Industrial uses</p> <p>Subsequent service life relevant for that use?: no</p> <p>Article category related to subsequent service life (AC): AC 0: Other: Not applicable</p>
8	Research and development.	as such (substance itself)	<p>Process category (PROC): PROC 15: Use as laboratory reagent</p> <p>Market sector by type of chemical product: PC 32: Polymer preparations and compounds</p> <p>Environmental release category (ERC): ERC 2: Formulation of preparations ERC 6d: Manufacture of uncured polyester resin</p> <p>Sector of end use (SU): SU 0: Other: n/a</p>

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			Subsequent service life relevant for that use?: no Article category related to subsequent service life (AC): AC 0: Other: n/a
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Annex II. Short description of all exposure scenarios for Chlorendic anhydride

Short description of all exposure scenarios with their use descriptors and life cycle chain:

IU No.	Name of ES	Volume (T/annum)	Identified uses				Life cycle stage		Sector of Use (SU)	Product Category (PC)	Process category (PROC)	Article category (AC)	Environmental Release Category (ERC)
			Manufacture	Formulation	Industrial use	Consumer use	Service life (for articles)	Waste stage					
IU 1 - 8	Manufacture of uncured resins	1200	--	X	X	--	--	--	SU 3, 10	PC 32	PROC 1,2, 3, 4, 5, 8a, 8b, 9, 15.	--	ERC 2, 6d

A total of 1200T/annum is to be imported, the environmental assessment was calculated with a 0.1 default for release to environment, the volume per formulation / polymerization is taken as 20T.

Annex III. Use at industrial sites; Polymer Preparations and Compounds

1.1. Title section

ES name: Manufacture of uncured resins

Product category: Polymer Preparations and Compounds (PC 32)

Environment	
1: <i>Manufacture of uncured polyester resin using chlorendic anhydride</i>	ERC 6d
Worker	
2: <i>Synthesis of uncured resin using chlorendic anhydride</i>	PROC 1
3: <i>Charging of chlorendic anhydride to reactor vessel.</i>	PROC 8b
4: <i>Analysis and research in laboratory situation.</i>	PROC 15

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure: *Manufacture of uncured polyester resin using chlorendic anhydride* (ERC 6d)

Daily amount per site <= 20.0 tonnes/day
Annual amount per site <= 250.0 tonnes/year
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow >= 2000 m3/day
Dedicated recollection infrastructure required for waste
Receiving surface water flow >= 18000 m3/day

1.2.2. Control of worker exposure: *Synthesis of uncured resin using chlorendic anhydride* (PROC 1)

Covers concentrations up to 1.0 %
Solid, low dustiness
Covers use up to 8.0 h/day
Assumes that activities are undertaken with appropriate and well maintained equipment by trained personnel operating under supervision.
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Wear suitable gloves tested to EN374.; If skin contamination is expected to extend to other parts of the body, then these body parts should also be protected with impervious garments in a manner equivalent to those described for the

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hands.; For further specification, refer to section 8 of the SDS.

Indoor use

Assumes process temperature up to 40.0 °C

1.2.3. Control of worker exposure: *Charging of chlorendic anhydride to reactor vessel. (PROC 8b)*

Covers concentrations up to 100.0 %

Solid, low dustiness

Covers use up to 0.25 h/day

Assumes that activities are undertaken with appropriate and well maintained equipment by trained personnel operating under supervision.

Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

Local exhaust ventilation; Inhalation - minimum efficiency of 95.0 %

Wear suitable respiratory protection.; Inhalation - minimum efficiency of 90.0 %; For further specification, refer to section 8 of the SDS.

Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.; If skin contamination is expected to extend to other parts of the body, then these body parts should also be protected with impervious garments in a manner equivalent to those described for the hands.; For further specification, refer to section 8 of the SDS.

Indoor use

Assumes process temperature up to 40.0 °C

1.2.4. Control of worker exposure: *Analysis and research in laboratory situation. (PROC 15)*

Covers concentrations up to 100.0 %

Solid, low dustiness

Covers use up to 8.0 h/day

Assumes that activities are undertaken with appropriate and well maintained equipment by trained personnel operating under supervision.

Provide a good standard of controlled ventilation (5 to 10 air changes per hour).

Local exhaust ventilation; Inhalation - minimum efficiency of 90.0 %

Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.; If skin contamination is expected to extend to other parts of the body, then these body parts should also be protected with impervious garments in a manner equivalent to those described for the hands.; For further specification, refer to section 8 of the SDS.

Indoor use

Assumes process temperature up to 40.0 °C

1.3. Exposure estimation and reference to its source

1.3.1. Environmental release and exposure: *Manufacture of uncured polyester resin using chlorendic anhydride (ERC 6d)*

Release route	Release rate	Release estimation method
Water	0.4 kg/day	Estimated release factor
Air	1 kg/day	Estimated release factor
Soil	5 kg/day	ERC

Protection target	Exposure estimate	RCR
Fresh water	0.02 mg/L (EUSES 2.1.2)	0.206

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Protection target	Exposure estimate	RCR
Sediment (freshwater)	0.075 mg/kg dw (EUSES 2.1.2)	0.774
Marine water	2E-3 mg/L (EUSES 2.1.2)	0.206
Sediment (marine water)	7.51E-3 mg/kg dw (EUSES 2.1.2)	0.774
Sewage Treatment Plant	0.2 mg/L (EUSES 2.1.2)	0.03
Agricultural soil	3.7E-3 mg/kg dw (EUSES 2.1.2)	0.035
Predator's prey (freshwater)	4.84E-4 mg/kg ww (EUSES 2.1.2)	< 0.01
Predator's prey (marine water)	4.84E-5 mg/kg ww (EUSES 2.1.2)	< 0.01
Top predator's prey (marine water)	9.67E-6 mg/kg ww (EUSES 2.1.2)	< 0.01
Predator's prey (terrestrial)	4.06E-4 mg/kg ww (EUSES 2.1.2)	< 0.01
Man via environment - Inhalation	9.52E-6 mg/m ³ (EUSES 2.1.2)	0.033
Man via environment - Oral	5.77E-5 mg/kg bw/day (EUSES 2.1.2)	0.345

1.3.2. Worker exposure: Synthesis of uncured resin using chlorendic anhydride (PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	7E-4 mg/m ³ (TRA Workers 3.0)	0.017
Inhalation, systemic, acute	2.8E-3 mg/m ³ (TRA Workers 3.0)	< 0.01
Inhalation, local, long term	7E-4 mg/m ³ (TRA Workers 3.0)	< 0.01
Inhalation, local, acute	2.8E-3 mg/m ³ (TRA Workers 3.0)	< 0.01
Dermal, systemic, long term	6.8E-4 mg/kg bw/day (TRA Workers 3.0)	0.058
Dermal, systemic, acute	6.8E-4 mg/kg bw/day (ECETOC TRA Workers)	< 0.01
Dermal, local, long term	1.98E-4 mg/cm ² (TRA Workers 3.0)	< 0.01
Dermal, local, acute	1.98E-4 mg/cm ² (TRA Workers 3.0)	< 0.01
Combined, systemic, acute		< 0.01

1.3.3. Worker exposure: Charging of chlorendic anhydride to reactor vessel. (PROC 8b)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	3.5E-5 mg/m ³ (TRA Workers 3.0)	< 0.01
Inhalation, systemic, acute	1.4E-3 mg/m ³ (TRA Workers 3.0)	< 0.01
Inhalation, local, long term	3.5E-5 mg/m ³ (TRA Workers 3.0)	< 0.01
Inhalation, local, acute	1.4E-3 mg/m ³ (TRA Workers 3.0)	< 0.01
Dermal, systemic, long term	3.43E-3 mg/kg bw/day (TRA Workers 3.0)	0.293
Dermal, systemic, acute	3.4E-3 mg/kg bw/day (ECETOC TRA Workers)	< 0.01
Dermal, local, long term	2.5E-4 mg/cm ² (TRA Workers 3.0)	< 0.01
Dermal, local, acute	2.5E-4 mg/cm ² (TRA Workers 3.0)	< 0.01
Combined, systemic, acute		< 0.01

1.3.4. Worker exposure: Analysis and research in laboratory situation. (PROC 15)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	3E-3 mg/m ³ (TRA Workers 3.0)	0.073
Inhalation, systemic, acute	0.012 mg/m ³ (TRA Workers 3.0)	< 0.01

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Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, local, long term	3E-3 mg/m ³ (TRA Workers 3.0)	< 0.01
Inhalation, local, acute	0.012 mg/m ³ (TRA Workers 3.0)	< 0.01
Dermal, systemic, long term	3.4E-3 mg/kg bw/day (TRA Workers 3.0)	0.291
Dermal, systemic, acute	3.4E-4 mg/kg bw/day (ECETOC TRA Workers)	< 0.01
Dermal, local, long term	9.92E-4 mg/cm ² (TRA Workers 3.0)	< 0.01
Dermal, local, acute	9.92E-4 mg/cm ² (TRA Workers 3.0)	< 0.01
Combined, systemic, acute		< 0.01

1.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance: If different operating conditions or risk management measures to those in this exposure scenario they must be equivalent or better in efficacy. This can be shown by use of exposure modelling software or by direct measurement of exposure.