

## 1. Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifier

# Leiston hardener

Hardener powder for Leiston Resin

CAS number: -  
EC number (EINECS/ELINCS): -  
EC index number: -  
REACH registration number: -

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

Identified uses of the substance or mixture: Plastic articles  
Not recommended uses of the substance or mixture: Other

### 1.3 Details of the supplier of the safety data sheet

**Manufacturer**

ERKODENT Erich Kopp GmbH  
Siemensstrasse 3

Telephone: 07445 8501 0  
Fax: 07445 2092

D 72285 Pfalzgrafenweiler

**Supplier**

ERKODENT Erich Kopp GmbH  
Siemensstrasse 3

Telephone: 07445 8501 0  
Fax: 07445 2092

D 72285 Pfalzgrafenweiler

**Information contact**

ERKODENT Erich Kopp GmbH

Information Telephone: 07445 8501 21

Information fax:

E-mail (competent person): w.heuchert@erkodent.com

Website: www.erkodent.com

**National contact**

ERKODENT Erich Kopp GmbH

Information Telephone: 07445 8501 0

Information fax:

E-mail (competent person): info@erkodent.com

Website:

### 1.4 Emergency telephone number

ERKODENT Erich Kopp GmbH  
Only available during office hours.

Telephone: 07445 8501 0

### 1.5 Dept. responsible for information

Entwicklung +49 (0) 7445 8501-21

## 2. Hazards identification

### 2.1 Classification of the substance or mixture

Regulation (EC) No 1272/2008:

Org. Perox. CD; H242 , Skin Sens. 1; H317 , Eye Irrit. 2; H319 , Repr. 2; H361 , Aquatic Acute 1; H400

Directive 67/548/EEC:

O; R7 , Xi; R36 , -; R43 , Repr. Cat. 3; R62 , N; R50 , -; R53

### 2.2 Label elements

#### 2.2.1 Labelling according to Regulation (EC) No 1272/2008

Hazard pictograms:



|                     |   |
|---------------------|---|
| <b>Signal word:</b> | GHS02,GHS07,GHS08,GHS09<br>Danger   |
| <b>H phrases:</b>   | 242 Heating may cause a fire.<br>317 May cause an allergic skin reaction.<br>319 Causes serious eye irritation.<br>361 Suspected of damaging fertility or the unborn child (state specific effect if known) (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard).   |
| <b>P phrases:</b>   | 400 Very toxic to aquatic life.<br>210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.<br>220 Keep/Store away from clothing/ combustible materials.<br>234 Keep only in original container.<br>264 Wash .? thoroughly after handling.<br>273 Avoid release to the environment.<br>280 Wear protective gloves/protective clothing/eye protection/face protection.<br>305+351+338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.<br>410 Protect from sunlight.<br>411+235 Store at temperatures not exceeding 25°C/77°F. Keep cool.<br>420 Store away from other materials.<br>501 <b>Dispose of contents/container</b> in accordance with the regional and national regulations |

#### 2.2.2 Labelling according to Directive 67/548/EEC

Hazard symbols:



|                   |  |
|-------------------|--|
| <b>R phrases:</b> | O Oxidizing.<br>Xn Harmful.<br>N Dangerous for the environment.<br>7 May cause fire.<br>36 Irritating to eyes.<br>43 May cause sensitization by skin contact.<br>50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.<br>62 Possible risk of impaired fertility. |
|-------------------|--|

**S phrases:** 3/9/14/49 Keep only in the original container in a cool, well-ventilated place away from .?.

15 Keep away from heat.

16 Keep away from sources of ignition - No smoking.

36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

50 Do not mix with other Materials

56 Dispose of this material and its container to hazardous or special waste collection point.

## 2.3 Other hazards

none

## 3. Composition/information on ingredients

### 3.1 Chemical characterization of the substance or mixture

Preparation related information

### 3.2 Composition of the substance or mixture

| Substance:             | EC-no.:   | CAS-No.: | INDEX no.:   | REACH-no.:           | Concentration: | Classification: EC 1272/2008(CLP):   | Classification: 67/548/EEC:                      |
|------------------------|-----------|----------|--------------|----------------------|----------------|--|--|
| Dibenzoyl peroxide     | 202-327-6 | 94-36-0  | 617-008-00-0 | 01-211951147<br>2-50 | 40 - 50 Gew.-% | Self-react. B; H241<br>Skin Sens. 1; H317<br>Eye Irrit. 2; H319<br>Aquatic Acute 1; H400 | E; R3<br>O; R7<br>Xi; R36<br>-; R43<br>N; R50/53 |
| Dicyclohexyl phthalate | 201-545-9 | 84-61-7  |              | 01-211997822<br>3-34 | 40 - 50 Gew.-% | Skin Sens. 1; H317<br>Repr. 2; H361<br>Aquatic Chronic. 3; H412                          | -; R43<br>Repr. Cat. 3; R62<br>-; R53            |

#### Ingredients with EC exposure limits

| Substance: | EC-no.: | CAS-No.: | INDEX no.: | REACH-no.: | Concentration: | Classification: EC 1272/2008(CLP): | Classification: 67/548/EEC: |
|------------|---------|----------|------------|------------|----------------|------------------------------------|-----------------------------|
|------------|---------|----------|------------|------------|----------------|------------------------------------|-----------------------------|

(The wording of the listed risk phrases is given in Chapter 16)

### 3.3 Additional information

none

## 4. First aid measures

### 4.1 Description of first aid measures

**General information:** Remove contaminated clothing immediately and dispose off safely.

**Following inhalation:** Move victim to fresh air. Put victim at rest and keep warm. If victim is at risk of losing consciousness, position and transport on their side. Seek medical attention if problems persist.

**After skin contact:** After contact with skin, wash immediately with plenty of water and soap.

**Following eye contact:** In case of contact with eyes, rinse immediately with plenty of flowing water for 10 to 15 minutes holding eyelids apart. In case of troubles or persistent symptoms, consult an ophthalmologist.

**After ingestion:** Seek medical attention if problems persist.

**Self-protection:** First aid assistant: Pay attention to self-protection!

### 4.2 Most important symptoms and effects, both acute and delayed

**Symptoms:** No information available.

**Nature of Hazard:** No information available.

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

**Emergency aid:** Let water be swallowed in little sips (dilution effect).

**Treatment:** First Aid, decontamination, treatment of symptoms.

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## 5. Fire fighting measures

### 5.1 General information

Use water spray/stream to protect personnel and to cool endangered containers.

### 5.2 Extinguishing media

**Suitable:** Carbon dioxide (CO<sub>2</sub>). Dry extinguishing powder. alcohol resistant foam. Water fog.

**Unsuitable:** High power water jet.

### 5.3 Special hazards arising from the substance or mixture

Can be released in case of fire: Pyrolysis products, toxic. Carbon monoxide. Carbon dioxide.

### 5.4 Advice for fire fighters

#### Special protective equipment for fire-fighters

In case of fire: Wear self-contained breathing apparatus.

#### Additional information

Collect contaminated fire extinguishing water separately. Do not allow entering drains or surface water.

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## 6. Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protection equipment. Guide people to safety. Provide adequate ventilation. Remove all sources of ignition.

### 6.2 Environmental precautions

In case of gas being released or leakage into waters, ground or the drainage system, the appropriate authorities must be informed. Do not allow to enter into surface water or drains. Use foam on spills to minimise vapours.

### 6.3 Methods and materials for containment and cleaning up

Take up mechanically, placing in appropriate containers for disposal. Avoid generation of dust.

### 6.4 References to other sections

Wet clean or vacuum up solids. Clear spills immediately. Do not use a brush or compressed air for cleaning surfaces or clothing.

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## 7. Handling and storage

### 7.1 Precautions for safe handling

#### Information for safe handling

Avoid generation of dust. Avoid contact with skin, eyes and clothes.

**Technical measures**

Provide for sufficient ventilation and punctiform suction at critical points.

**Precautions against fire and explosion**

Keep away from sources of ignition - No smoking. Take precautionary measures against static discharge. Usual measures for fire prevention.

**Additional information**

none

**7.2 Conditions for safe storage, including any incompatibilities****Technical measures and storage conditions**

Ensure adequate ventilation of the storage area.

**Packaging materials**

Keep/Store only in original container.

**Requirements for storerooms and containers**

Keep in a cool, well-ventilated place. Put lids on containers immediately after use.

**Information about storing together in storage facility**

Do not store together with: acid. Alkalis (alkalis). Heavy metals. Amines. Keep away from food, drink and animal feedingstuffs.

**Further information concerning storage conditions**

Maximum storage temperature: °C Keep away from heat. Protect from sunlight.

**Storage class:** 5.2 Organic peroxides.

**7.3 Specific end use(s)**

Observe instructions for use. Observe technical data sheet.

**8. Exposure controls / personal protection****8.1 Control parameters****8.1.1 Limits for occupational exposure****Exposure limit values**

| Substance:         | CAS-No.: | Source:                              | Occupational exposure limit value: | Limitation of exposure peaks: | Remark: |
|--------------------|----------|--------------------------------------|------------------------------------|-------------------------------|---------|
| Dibenzoyl peroxide | 94-36-0  | TRGS 900<br>(Dibenzoylperoxid 01/06) | 5 mg/m <sup>3</sup> E              | 1 (1)                         | DFG     |

**EC exposure limit values**

| Substance: | CAS-No.: | Source: | Occupational exposure limit value: | Limitation of exposure peaks: | Remark: |
|------------|----------|---------|------------------------------------|-------------------------------|---------|
|------------|----------|---------|------------------------------------|-------------------------------|---------|

**8.1.2 DNEL and PNEC values****DNEL-values**

| Substance:         | CAS-No.: | DNEL/DMEL                       | Industry | Professional | consumer        |
|--------------------|----------|---------------------------------|----------|--------------|-----------------|
| Dibenzoyl peroxide | 94-36-0  | Ingestion short term (acute)    |          |              |                 |
|                    |          | Ingestion Long Term (repeated)  |          |              | 1,65 mg/kg KG/d |
|                    |          | Skin contact short term (acute) |          |              |                 |

|                        |         |                                   |                         |                         |                       |
|------------------------|---------|-----------------------------------|-------------------------|-------------------------|-----------------------|
|                        |         | Skin contact Long Term (repeated) | 6,6 mg/kg KG/d          | 6,6 mg/kg KG/d          | 3,3 mg/kg KG/d        |
|                        |         | Inhalation short term (acute)     |                         |                         |                       |
|                        |         | Inhalation Long Term (repeated)   | 11,75 mg/m <sup>3</sup> | 11,75 mg/m <sup>3</sup> | 2,9 mg/m <sup>3</sup> |
| Dicyclohexyl phthalate | 84-61-7 | Ingestion short term (acute)      |                         |                         |                       |
|                        |         | Ingestion Long Term (repeated)    |                         |                         |                       |
|                        |         | Skin contact short term (acute)   |                         |                         |                       |
|                        |         | Skin contact Long Term (repeated) | 0,5 mg/kg KG/d          | 0,5 mg/kg KG/d          |                       |
|                        |         | Inhalation short term (acute)     |                         |                         |                       |
|                        |         | Inhalation Long Term (repeated)   | 35,2 mg/m <sup>3</sup>  | 35,2 mg/m <sup>3</sup>  |                       |

**PNEC-values**

| Substance: | CAS-No.: | PNEC | Worker, industry | Worker, professional | consumer |
|------------|----------|------|------------------|----------------------|----------|
|------------|----------|------|------------------|----------------------|----------|

**8.1.3 Control-Banding****Control-Banding**

none

**8.1.4 Additional information**

DFG

**8.2 Exposure controls****Occupational exposure controls**

Provide for sufficient ventilation and punctiform suction at critical points. Technical measures and the application of suitable work processes have priority over personal protection equipment.

**Chemical handling**

Do not eat, drink, smoke or sneeze at the workplace. Wash hands before breaks and at the end of work. Apply skin care products after work. Wash contaminated clothing prior to re-use.

**Personal protection equipment**

Minimum standard for preventive measures while handling with working materials are specified in the TRGS 500.

**Respiratory protection**

Respiratory protection required in case of: insufficient ventilation. filter respirator (full mask or mouth-piece) with filter:

**Hand protection**

Tested protective gloves are to be worn: DIN EN 374 Suitable material: Butyl caoutchouc (butyl rubber). FKM (fluoro rubber). NBR (Nitrile rubber). CR (polychloroprene, chloroprene rubber).

**Eye protection**

Tightly sealed safety glasses.

**Skin protection**

For the protection against direct skin contact, body protective clothing is essential (in addition to the usual working clothes). Only wear fitting, comfortable and clean protective clothing. Barrier creams are not substitutes for body protection.

**Environmental exposure controls**

refer to chapter 7. No further action is necessary.

**Consumer exposure controls**

refer to chapter 7. No further action is necessary.

**8.3 Exposure scenario**

none

**9. Physical and chemical properties****9.1 Information on basic physical and chemical properties****Appearance**

**State of matter:** solid: Powder  
**Colour:** off-white  
**Odour:** characteristic  
**Odour threshold:** No data available

**Safety relevant basis data**

|  | Parameter | Value | Unit              | Remark                                  |
|--|-----------|-------|-------------------|---|
| <b>Density:</b>                                |           |       |                   | No data available                       |
| <b>Package density:</b>                        | at °C:    | 610   | kg/m <sup>3</sup> |   |
| <b>pH:</b>                                     |           |       |                   | not applicable                          |
| <b>Melting point / range:</b>                  |           |       |                   | not applicable                          |
| <b>Boiling temperature / range:</b>            |           |       |                   | not applicable                          |
| <b>Flash point:</b>                            |           |       |                   | not applicable                          |
| <b>Flammability:</b>                           |           |       |                   | No data available                       |
| <b>Lower flammability limit:</b>               |           |       |                   | not applicable                          |
| <b>Upper flammability limit:</b>               |           |       |                   | not applicable                          |
| <b>Explosion hazard:</b>                       |           |       |                   | Danger of dust explosion                |
| <b>Lower explosion limit:</b>                  |           |       |                   | No data available                       |
| <b>Upper explosion limit:</b>                  |           |       |                   | No data available                       |
| <b>Ignition temperature:</b>                   |           |       |                   | none Risk of selfignition.              |
| <b>Decomposition temperature:</b>              |           | > 60  | °C                | UN Test H.1: United States<br>SADT test |
| <b>Oxidizing characteristics:</b>              |           |       |                   | oxidizing                               |
| <b>Vapour pressure:</b>                        |           |       |                   | not applicable                          |
| <b>Relative vapour density:</b>                |           |       |                   | not applicable                          |
| <b>Speed of vaporization/evaporation rate:</b> |           |       |                   | not applicable                          |
| <b>Solubility in water:</b>                    |           |       |                   | No data available                       |
| <b>Fat solubility:</b>                         |           |       |                   | No data available                       |
| <b>Solubility in</b>                           | :         |       |                   | not applicable                          |
| <b>log P O/W (n-octanol / water):</b>          |           |       |                   | No data available                       |
| <b>Viscosity:</b>                              |           |       |                   | not applicable                          |
| <b>Solvent separation test:</b>                |           |       |                   | not applicable                          |
| <b>Solvent content:</b>                        |           |       |                   | not applicable                          |

**9.2 Other information**

3,2 - 3,5 Available oxygen content (%)

**10. Stability and reactivity****10.1 Reactivity**

No information available.

## 10.2 Chemical stability

Thermal decomposition

## 10.3 Possibility of hazardous reactions

Exothermal decomposition with formation of: Pyrolysis products, toxic

## 10.4 Conditions to avoid

heat. UV-radiation/sunlight.

## 10.5 Incompatible materials

Acid. Alkalis (alkalis). Heavy metals. Amines.

## 10.6 Hazardous decomposition products

Pyrolysis products, toxic. Carbon monoxide. Carbon dioxide.

## 10.7 Additional information

none

# 11. Toxicological information

## 11.1 Information on toxicological effects

Data apply to the principal component.

### Acute toxicity

| Substance:             | CAS-No.: | Toxicological information                         |
|------------------------|----------|---|
| Dibenzoyl peroxide     | 94-36-0  | Akute Toxizität, oral LD50: > 5000 mg/kg (Ratte.) |
| Dicyclohexyl phthalate | 84-61-7  | Akute Toxizität, oral LD50: > 2000 mg/kg (Ratte.) |

### Specific symptoms in laboratory animals

none

## 11.2 Irritation and etching

### Irritant effect on the skin

Not an irritant.

### Irritant effect on the eye

irritant.

### Irritant effect on the respiratory tract

slightly irritant but not relevant for classification.

### Etching

not corrosive

## 11.3 Sensitization

May cause sensitization by skin contact.

## 11.4 Repeated dose toxicity

No information available.

## 11.5 CMR effects

### Carcinogenicity

No indications of human carcinogenicity exist.

### Mutagenicity

No indications of human germ cell mutagenicity exist.

### Reproductive toxicity



Category 2 (EU): Materials that should be regarded to be and handled as reproductive (fertility) hazards.

## 11.6 General remarks

none

### Practical experience

none

### Other observations

none

### Additional information

Data arise from reference works and literature.

## 12. Ecological information

### 12.1 Toxicity

The information about ecology refers to the main components.

#### Eco toxicity

| Substance:         | CAS-No.: | Ecotoxicity  |
|--------------------|----------|--|
| Dibenzoyl peroxide | 94-36-0  | Akute Fischtoxizität LC50: 0,0602 mg/l/96 h (Regenbogenforelle [Oncorhynchus mykiss])<br>Akute Daphnientoxizität EC50: 0,110 mg/l/48 h (Großer Wasserfloh[Daphnia magna])<br>Akute Algentoxizität EC50: 0,0711 mg/l/72 h ([Pseudokirchneriella subcapitata]) |

### 12.2 Persistence and degradability

not readily biodegradable (according to OECD criteria)

### 12.3 Bio accumulative potential

No information available.

### 12.4 Mobility in soil

No information available.

### 12.5 Results of PBT and vPvB assessment

The components in this formulation do not meet the criteria for classification as PBT or vPvB.

### 12.6 Other adverse effects

Very toxic to aquatic life.

### 12.7 Further ecological information

Do not empty into drains or the aquatic environment. Use foam on spills to minimise vapours.

### 12.8 Further details

Data arise from reference works and literature.

## 13. Disposal considerations

### 13.1 Waste treatment methods

#### Appropriate disposal/Product

Waste disposal according to EC Directives 75/442/EEC and 91/689/EEC on waste and hazardous waste in their latest versions.

**Appropriate disposal/ packaging**

Cleaned containers may be recycled. Handle contaminated packaging in the same way as the substance itself.

**Control report for waste code/ waste marking according to EAKV**

According to EAKV, allocation of waste identity numbers/waste descriptions must be carried out in a specific way for every industry and process.

**Waste key product:** 16 09 04 - oxidierende Stoffe a. n. g.

**Waste key packaging:** 15 01 10 - Verpackungen, die Rückstände gefährlicher Stoffe enthalten oder durch gefährliche Stoffe verunreinigt sind

**Remark**

Waste disposal according to official state regulations.

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**14. Transport information****14.1 Overland transport (ADR/RID)****Proper Shipping name**

ORGANISCHES PEROXID TYP D, FEST, UMWELTGEFAEHRDEND  
DIBENZOYLPEROXID

**UN No.:** 3106

**Label:** 5.2

**Packing Group:** -

**Classification code:** P1

**Remark:** Transport category: Tunnel restriction code: Limited quantity (LQ): Special provisions:

**14.2 Transport by sea (IMDG)****Proper Shipping name**

ORGANIC PEROXIDE TYPE D, SOLID, MARINE POLLUTANT  
DIBENZOYL PEROXIDE

**UN-No.:** 3106

**Label:** 5.2

**Packing Group:** -

**Marine pollutant:** PP

**EmS-No:** F-J, S-R

**MFAG:** 5226

**Special Provisions:** Keep away from food, drink and animal feedingstuffs.

**Remark:** Limited quantity (LQ): Special provisions:

**14.3 Air transport (ICAO-TI / IATA-DGR)****Proper Shipping name**

ORGANIC PEROXIDE TYPE D, SOLID  
DIBENZOYL PEROXIDE

**UN/ID-No.:** 3106

**Label:** 5.2

**Packing Group:** -

**Remark:** Limited quantity (LQ):

**14.4 Mail**

Overland transport (ADR/RID)

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**15. Regulatory information****15.1 Labelling****Hazardous component(s) for labelling**

Dibenzoyl peroxide; Dicyclohexyl phthalate

**Special labelling of particular preparations**

Safety data sheet available for professional user on request.

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

### EU-Regulations

**Directive 1999/13/EC on the limitation of emissions of volatile organic compounds (VOC-RL)**  
none

**Regulation (EC) No 2037/2000 on substances that deplete the ozone layer**  
none

**Regulation (EC) No 850/2004 on persistent organic pollutants**  
none

**Regulation (EC) No 689/2008 concerning the export and import of dangerous chemicals**  
none

**Regulation (EC) No 648/2004 (Detergents regulation)**  
none

**Restrictions under Title VIII of Regulation (EC) No 1907/2006**  
none

### National regulations

Moreover, national legislation has to be observed!

### Informations on working limitations

Observe restrictions to employment for juvenils according to the 'juvenile work protection guideline' (94/33/EC). Observe employment restrictions under the Maternity Protection Directive (92/85/EEC) for expectant or nursing mothers.

### Major Accidents Ordinance

Not subject to StörfallVO.

### Storage class according to VCI

5.2 Organic peroxides.

### Water Hazard Class according to VwVwS

2 water pollutant (WGK 2)

### Technical Instructions on Air Quality Control (TA-Luft)

Number 5.2.5. Class I Total dust emission value may not be exceeded. (see No. 5.2.1). XXXX Class: Total dust emission value may not be exceeded. (see No. 5.2.1).

### Further regulations, limitations and legal requirements

TRGS 900 "Luftgrenzwerte"

TRGS 540 "Sensibilisierende Stoffe"

"Umgang mit Gefahrstoffen" (BGV B1)

"Organische Peroxide" (BGV B4)

"Grundsätze der Prävention" (BGV A1)

M 004 "Reizende Stoffe/ätzende Stoffe"

M 001 "Organische Peroxide"

BGR 104 - Richtlinie für die Vermeidung der Gefahren durch explosionsfähige Atmosphäre (EX-RL)(Berufsgenossenschaft).

BGR 132 - Richtlinie für die Vermeidung von Zündgefahren infolge elektrostatischer Aufladungen(Berufsgenossenschaft).

## 15.3 Chemical safety assessment

**For this preparation a chemical safety assessment has been carried out:** -

Chemical safety assessments for substances in this mixture were not carried out.

## 16. Other information

### 16.1 Wording of the H and R-phrases under paragraph 3

#### Regulation (EC) No 1272/2008

- 241 Heating may cause a fire or explosion.
- 317 May cause an allergic skin reaction.
- 319 Causes serious eye irritation.
- 361 Suspected of damaging fertility or the unborn child (state specific effect if known) (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard).
- 400 Very toxic to aquatic life.
- 412 Harmful to aquatic life with long lasting effects.

#### Directive 67/548/EEC

- 3 Extreme risk of explosion by shock, friction, fire or other sources of ignition.
- 7 May cause fire.
- 36 Irritating to eyes.
- 43 May cause sensitization by skin contact.
- 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- 52 Harmful to aquatic organisms.
- 62 Possible risk of impaired fertility.

### 16.2 Training instructions

none

### 16.3 Recommended restrictions of use

refer to chapter 1.

### 16.4 Further remarks

The above information describes exclusively the safety requirements of the product and is based on our present-day knowledge. The information is intended to give you advice about the safe handling of the product named in this safety data sheet, for storage, processing, transport and disposal. The information cannot be transferred to other products. In the case of mixing the product with other products or in the case of processing, the information on this safety data sheet is not necessarily valid for the new made-up material.

### 16.5 Documentation of changes

none

### 16.6 Data sources

Data arise from reference works and literature.

### 16.7 Key and definition

none

## 17. Appendix

### 17.1 Exposure scenario

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