# SAFETY DATA SHEET

Based upon Regulation (EC) No 1907/2006, as amended by Regulation (EU) No 2015/830

# zinc calcine

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

### 1.1. Product identifier

| | | |
|---|---|---|
| **Product name** | : | zinc calcine |
| **Synonyms** | : | Calcines, zinc ore-conc.; roasted zinc concentrate; ZnO Type MH-CL |
| **Registration number REACH** | : | 01-2119485288-24-0002 (Nyrstar Belgium NV/SA)<br>01-2119485288-24-0007 (Nyrstar Budel BV)<br>01-2119485288-24-0004 (Nyrstar France SAS) |
| **Product type REACH** | : | Substance/UVCB |
| | : | Transported isolated intermediate |
| | : | On-site isolated intermediate |
| **CAS number** | : | 69012-79-9 |
| **EC number** | : | 273-776-3 |

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

#### 1.2.1 Relevant identified uses

Under Regulation (EC) No 1907/2006 the substance is defined as an on-site and transported isolated intermediate and must be used in correspondence to that status, including the application of strictly controlled conditions

IU1: production of the intermediate -Zinc raw materials (concentrates) are blended and roasted at high temperature in order to produce a Zinc Calcine. The process is carried out in closed furnaces with occasional controlled exposure and transfer of the calcine for further extraction of Zinc metal or Zinc compounds.

IU2: use of the intermediate - The calcine (273-776-3) is unloaded, optionally blended with other recycled zinc bearing materials and loaded in leaching reactors (hydrometallurgical processing) for further refining and extraction of Zinc metal or Zinc compounds.

Metal industry: recycling

For further details concerning the management measures: see the attached annex

#### 1.2.2 Uses advised against

No uses advised against known

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

**Supplier of the safety data sheet**

Nyrstar Belgium N.V. on behalf of Nyrstar Sales & Marketing A.G.
Zinkstraat 1
B-2490 Balen
☎ +32 14 44 95 00
🖷 +32 14 81 05 31
infoSDS@nyrstar.com

Nyrstar Budel B.V. on behalf of Nyrstar Sales & Marketing A.G.
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6024 AA Budel-Dorplein
☎ +32 14 44 96 80
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infoSDS@nyrstar.com

Nyrstar France S.A.S. on behalf of Nyrstar Sales & Marketing A.G.
Rue Jean Jacques Rousseau
F-59950 Auby
☎ +32 14 44 96 80
🖷 +33 3 27 88 39 48
infoSDS@nyrstar.com

**Manufacturer of the product**

NYRSTAR Sales & Marketing AG
Tessinerplatz 7
CH-8002 Zürich
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🖷 +41 44 745 81 10
infoSDS@nyrstar.com

### 1.4. Emergency telephone number

24h/24h (Telephone advice: English, French, German, Dutch):

+32 14 58 45 45 (BIG)

## SECTION 2: Hazards identification

### 2.1. Classification of the substance or mixture

Classified as dangerous according to the criteria of Regulation (EC) No 1272/2008

| Class | Category | Hazard statements |
|---|---|---|
| Carc. | category 1A | H350i: May cause cancer by inhalation. |
| Repr. | category 1A | H360Df: May damage the unborn child. Suspected of damaging fertility. |
| STOT RE | category 2 | H373: May cause damage to organs (blood system, central nervous system, lungs, kidneys) through prolonged or repeated exposure if swallowed and if inhaled (major route). |
| Eye Dam. | category 1 | H318: Causes serious eye damage. |
| Aquatic Acute | category 1 | H400: Very toxic to aquatic life. |
| Aquatic Chronic | category 1 | H410: Very toxic to aquatic life with long lasting effects. |

### 2.2. Label elements

**Signal word** Danger

**H-statements**

| | |
|---|---|
| H350i | May cause cancer by inhalation. |
| H360Df | May damage the unborn child. Suspected of damaging fertility. |
| H373 | May cause damage to organs (blood system, central nervous system, lungs, kidneys) through prolonged or repeated exposure if swallowed and if inhaled (major route). |
| H318 | Causes serious eye damage. |
| H410 | Very toxic to aquatic life with long lasting effects. |

**P-statements**

| | |
|---|---|
| P280 | Wear eye protection/face protection. |
| P260 | Do not breathe dust. |
| P270 | Do not eat, drink or smoke when using this product. |
| P273 | Avoid release to the environment. |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P310 | Immediately call a POISON CENTER/doctor. |
| P391 | Collect spillage. |

**Supplemental information**

Restricted to professional users.

### 2.3. Other hazards

Produces effects on the nervous system

## SECTION 3: Composition/information on ingredients

### 3.1. Substances

| Name<br>REACH Registration No | CAS No<br>EC No | Conc. (C) | Classification according to CLP | Note | Remark |
|---|---|---|---|---|---|
| zinc oxide | 1314-13-2<br>215-222-5 | 51.9%<br><C<95% | Aquatic Acute 1; H400<br>Aquatic Chronic 1; H410 | (1)(2) | 50 % < total Zn content < 80 % |
| copper oxide | 1317-38-0<br>215-269-1 | 0%<C<2.5% | Aquatic Acute 1; H400<br>Aquatic Chronic 1; H410 | (1)(2) | Constituent |
| zinc ferrite brown spinel | 68187-51-9<br>269-103-8 | C<21.6% | | | 50 % < total Zn content < 80 % |
| cadmium oxide (non-pyrophoric) | 1306-19-0<br>215-146-2 | 0%<C<0.57% | Carc. 1B; H350<br>Muta. 2; H341<br>Repr. 2; H361fd<br>Acute Tox. 2; H330<br>STOT RE 1; H372<br>Aquatic Acute 1; H400<br>Aquatic Chronic 1; H410 | (1)(2)(4)(10) | Constituent |
| lead monoxide | 1317-36-8<br>215-267-0 | 0%<C<5.39% | Repr. 1A; H360Df<br>Acute Tox. 4; H332<br>Acute Tox. 4; H302<br>STOT RE 2; H373<br>Aquatic Acute 1; H400<br>Aquatic Chronic 1; H410 | (1)(2)(10)(4) | Constituent |
| iron arsenate | 10102-49-5<br>233-274-7 | 0%<C<1.3% | Carc. 1A; H350<br>Acute Tox. 3; H331<br>Acute Tox. 3; H301<br>Aquatic Acute 1; H400<br>Aquatic Chronic 1; H410 | (1)(2)(10) | Constituent |

| | | | | | |
|---|---|---|---|---|---|
| diantimony trioxide | 1309-64-4<br>215-175-0 | 0%<C<0.36% | Carc. 2; H351 | (1)(2) | Constituent |
| quartz (SiO2) | 14808-60-7<br>238-878-4 | 1%<C<10% | STOT RE 2; H373 | (1)(2) | Constituent |
| manganese oxide | 1344-43-0<br>215-695-8 | 0%<C<1.03% | | (2) | Constituent |
| aluminium oxide | 1344-28-1<br>215-691-6 | C<5% | | (2) | Constituent |
| calcium oxide | 1305-78-8<br>215-138-9 | 0%<C<5% | STOT SE 3; H335<br>Skin Irrit. 2; H315<br>Eye Dam. 1; H318 | (1)(2) | Constituent |
| magnesium oxide | 1309-48-4<br>215-171-9 | 0%<C<0.99% | | (2) | Constituent |

(2) Substance with a Community workplace exposure limit
(1) For H-statements in full: see heading 16
(4) Enumerated in candidate list of substances of very high concern (SVHC) for authorisation (Article 59 of Regulation (EC) No. 1907/2006)
(10) Subject to restrictions of Annex XVII of Regulation (EC) No. 1907/2006

### 3.2. Mixtures

Not applicable

## SECTION 4: First aid measures

### 4.1. Description of first aid measures

**General:**

Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

**After inhalation:**

Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

**After skin contact:**

Rinse with water. Take victim to a doctor if irritation persists.

**After eye contact:**

Rinse immediately with plenty of water for 15 minutes. Do not apply neutralizing agents. Take victim to an ophthalmologist.

**After ingestion:**

Rinse mouth with water. Victim is fully conscious: immediately induce vomiting. Consult a doctor/medical service if you feel unwell.

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

**4.2.1 Acute symptoms**

**After inhalation:**

AFTER INHALATION OF FUME: FOLLOWING SYMPTOMS MAY APPEAR LATER: Metal fume fever. Feeling of weakness. Body temperature rise. Headache. Nausea. Vomiting. Metal taste. Muscular pain. Rapid respiration. Respiratory difficulties. Possible oedema of the upper respiratory tract. Risk of lung oedema. Respiratory collapse.

**After skin contact:**

No effects known.

**After eye contact:**

Inflammation/damage of the eye tissue. Corrosion of the eye tissue.

**After ingestion:**

AFTER INGESTION OF HIGH QUANTITIES: Metal taste. Dry/sore throat. Nausea. Vomiting. Abdominal pain. Feeling of weakness. Headache.

**4.2.2 Delayed symptoms**

No effects known.

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

If applicable and available it will be listed below.

## SECTION 5: Firefighting measures

The information in this section is a general description. If available, the documentation for isolated intermediates will be attached in annex to support safe handling arrangements.

### 5.1. Extinguishing media

**5.1.1 Suitable extinguishing media:**

Adapt extinguishing media to the environment.

**5.1.2 Unsuitable extinguishing media:**

No unsuitable extinguishing media known.

### 5.2. Special hazards arising from the substance or mixture

On burning: release of harmful/irritant gases/vapours and formation of metallic fumes.

### 5.3. Advice for firefighters

**5.3.1 Instructions:**

Dilute toxic gases with water spray. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.

**5.3.2 Special protective equipment for fire-fighters:**

Gloves. Protective clothing. Dust cloud production: compressed air/oxygen apparatus. Heat/fire exposure: compressed air/oxygen apparatus.

## SECTION 6: Accidental release measures

The information in this section is a general description. If available, the documentation for isolated intermediates will be attached in annex to support safe handling arrangements.

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

Prevent dust cloud formation. No naked flames.

**6.1.1 Protective equipment for non-emergency personnel**

See heading 8.2

**6.1.2 Protective equipment for emergency responders**

Gloves. Protective clothing. Dust cloud production: compressed air/oxygen apparatus.

Suitable protective clothing

See heading 8.2

### 6.2. Environmental precautions

Contain released product, pump into suitable containers. Plug the leak, cut off the supply. Dam up the solid spill. Knock down/dilute dust cloud with water spray. Prevent soil and water pollution. Prevent spreading in sewers.

### 6.3. Methods and material for containment and cleaning up

Prevent dust cloud formation. Scoop solid spill into closing containers. Carefully collect the spill/leftovers. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

### 6.4. Reference to other sections

See heading 13.

## SECTION 7: Handling and storage

The information in this section is a general description. If available, the documentation for isolated intermediates will be attached in annex to support safe handling arrangements.

### 7.1. Precautions for safe handling

Avoid raising dust. Keep away from naked flames. Observe very strict hygiene - avoid contact. Keep container tightly closed. Remove contaminated clothing immediately. Do not discharge the waste into the drain. Avoid dehydratation.

### 7.2. Conditions for safe storage, including any incompatibilities

**7.2.1 Safe storage requirements:**

Store in a dry area. Store at room temperature. Keep locked up. Unauthorized persons are not admitted. Meet the legal requirements.

**7.2.2 Keep away from:**

Oxidizing agents, (strong) acids.

**7.2.3 Suitable packaging material:**

No data available

**7.2.4 Non suitable packaging material:**

No data available

### 7.3. Specific end use(s)

If available, the documentation for isolated intermediates will be attached in annex to support safe handling arrangements.

## SECTION 8: Exposure controls/personal protection

### 8.1. Control parameters

**8.1.1 Occupational exposure**

a) Occupational exposure limit values

If limit values are applicable and available these will be listed below.

**EU**

| | | |
|---|---|---|
| Inorganic lead and its compounds | Time-weighted average exposure limit 8 h (Binding occupational exposure limit value) | 0.15 mg/m³ |

**Belgium**

| | | |
|---|---|---|
| Aluminium (métal et composés insolubles, fraction alvéolaire) | Time-weighted average exposure limit 8 h | 1 mg/m³ |
| Antimoine et ses composés (en Sb) | Time-weighted average exposure limit 8 h | 0.5 mg/m³ |
| Arsenic et ses composés inorganiques (en As) | Time-weighted average exposure limit 8 h | 0.01 mg/m³ |
| Calcium (oxyde de) | Time-weighted average exposure limit 8 h | 2 mg/m³ |
| Magnésium (oxyde de) (fumées) | Time-weighted average exposure limit 8 h | 10 mg/m³ |
| Manganèse et ses composés (en Mn) | Time-weighted average exposure limit 8 h | 0.2 mg/m³ |
| Plomb inorg. (poussières et fumées) (en Pb) | Time-weighted average exposure limit 8 h | 0.15 mg/m³ |
| Silices cristallines : quartz (poussières alvéolaires) | Time-weighted average exposure limit 8 h | 0.1 mg/m³ |
| Zinc (oxyde de) ( fumées) | Time-weighted average exposure limit 8 h | 2 mg/m³ |
| | Short time value | 10 mg/m³ |

**The Netherlands**

| | | |
|---|---|---|
| Aluminiumoxide | Time-weighted average exposure limit 8 h (Private occupational exposure limit value) | 10 mg/m³ |
| Antimoonverbindingen (als Sb) | Time-weighted average exposure limit 8 h (Public occupational exposure limit value) | 0.5 mg/m³ |
| Cadmiumoxide (rook) (als Cd) | Time-weighted average exposure limit 8 h (Public occupational exposure limit value) | 0.005 mg/m³ |
| Calciumoxide | Time-weighted average exposure limit 8 h (Private occupational exposure limit value) | 0.86 ppm |
| | Time-weighted average exposure limit 8 h (Private occupational exposure limit value) | 2 mg/m³ |
| | Short time value (Private occupational exposure limit value) | 2.1 ppm |
| | Short time value (Private occupational exposure limit value) | 5 mg/m³ |
| In water onoplosbare zouten van arseenzuur (als As) | Time-weighted average exposure limit 8 h (Public occupational exposure limit value) | 0.0028 mg/m³ |
| Koper en anorganische koperverbindingen (inhaleerbaar) | Time-weighted average exposure limit 8 h (Public occupational exposure limit value) | 0.1 mg/m³ |
| Lood en anorg. verbindingen (rook en stof) (als Pb) | Time-weighted average exposure limit 8 h (Private occupational exposure limit value) | 0.15 mg/m³ |
| Lood en anorganische loodverbindingen | Time-weighted average exposure limit 8 h (Private occupational exposure limit value) | 0.15 mg/m³ |
| Mangaanverbindingen (als Mn) | Time-weighted average exposure limit 8 h (Private occupational exposure limit value) | 1 mg/m³ |
| | Short time value (Private occupational exposure limit value) | 3 mg/m³ |
| Silicium(di)oxide kwarts (respirabel) | Time-weighted average exposure limit 8 h (Public occupational exposure limit value) | 0.075 mg/m³ |
| Zinkoxide (rook) | Time-weighted average exposure limit 8 h (Private occupational exposure limit value) | 5 mg/m³ |

**France**

| | | |
|---|---|---|
| Aluminium (trioxyde de di-) | Time-weighted average exposure limit 8 h (VL: Valeur non réglementaire indicative) | 10 mg/m³ |
| Antimoine et ses composés, en Sb | Time-weighted average exposure limit 8 h (VL: Valeur non réglementaire indicative) | 0.5 mg/m³ |
| Cadmium (oxyde de), en Cd | Short time value (VL: Valeur non réglementaire indicative) | 0.05 mg/m³ |
| Calcium (oxyde de) | Time-weighted average exposure limit 8 h (VL: Valeur non réglementaire indicative) | 2 mg/m³ |
| Magnésium (oxyde de), fumées | Time-weighted average exposure limit 8 h (VL: Valeur non réglementaire indicative) | 10 mg/m³ |
| Plomb métallique et composés, en Pb | Time-weighted average exposure limit 8 h (VRC: Valeur réglementaire contraignante) | 0.1 mg/m³ |
| Silices cristallines quartz, fraction alvéolaire | Time-weighted average exposure limit 8 h (VRC: Valeur réglementaire contraignante) | 0.1 mg/m³ |
| Zinc (oxyde de, fumées) | Time-weighted average exposure limit 8 h (VL: Valeur non réglementaire indicative) | 5 mg/m³ |
| Zinc (oxyde de, poussières) | Time-weighted average exposure limit 8 h (VL: Valeur non réglementaire indicative) | 10 mg/m³ |

**Germany**

| | | |
|---|---|---|
| Blei und anorganischen Bleiverbindungen | Time-weighted average exposure limit 8 h (TRGS 505) | 0.1 mg/m³ |
| Calciumoxid | Time-weighted average exposure limit 8 h (TRGS 900) | 1 mg/m³ |
| Mangan und seine anorganischen Verbindungen | Time-weighted average exposure limit 8 h (TRGS 900) | 0.02 mg/m³ |
| | Time-weighted average exposure limit 8 h (TRGS 900) | 0.2 mg/m³ |

**UK**

| | | |
|---|---|---|
| Aluminium oxides inhalable dust | Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005)) | 10 mg/m³ |
| Aluminium oxides respirable dust | Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005)) | 4 mg/m³ |

| | | |
|---|---|---|
| Antimony and compounds except stibine (as Sb) | Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005)) | 0.5 mg/m³ |
| Arsenic and compounds except arsine (as As) | Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005)) | 0.1 mg/m³ |
| Cadmium oxide fume (as Cd) | Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005)) | 0.025 mg/m³ |
| | Short time value (Workplace exposure limit (EH40/2005)) | 0.05 mg/m³ |
| Calcium oxide | Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005)) | 2 mg/m³ |
| Lead other than lead alkyls | Time-weighted average exposure limit 8 h (Occupational exposure limit (Control of lead at work)) | 0.15 mg/cm³ |
| Magnesium oxide (as Mg) fume and respirable dust | Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005)) | 4 mg/m³ |
| Magnesium oxide (as Mg) inhalable dust | Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005)) | 10 mg/m³ |
| Manganese inorganic compounds (as Mn) | Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005)) | 0.5 mg/m³ |
| Silica, respirable crystalline | Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005)) | 0.1 mg/m³ |

**USA (TLV-ACGIH)**

| | | |
|---|---|---|
| Aluminium, insoluble compounds | Time-weighted average exposure limit 8 h (TLV - Adopted Value) | 1 mg/m³ (R) |
| Arsenic, inorganic compounds (exept Arsine), as As | Time-weighted average exposure limit 8 h (TLV - Adopted Value) | 0.01 mg/m³ |
| Cadmium, compounds, as Cd | Time-weighted average exposure limit 8 h (TLV - Adopted Value) | 0.01 mg/m³ |
| Calcium oxide | Time-weighted average exposure limit 8 h (TLV - Adopted Value) | 2 mg/m³ |
| Lead, inorganic compounds, as Pb | Time-weighted average exposure limit 8 h (TLV - Adopted Value) | 0.05 mg/m³ |
| Magnesium oxide | Time-weighted average exposure limit 8 h (TLV - Adopted Value) | 10 mg/m³ (I) |
| Manganese, inorganic compounds, as Mn | Time-weighted average exposure limit 8 h (TLV - Adopted Value) | 0.1 mg/m³ (I) |
| Silica-Crystalline Quartz | Time-weighted average exposure limit 8 h (TLV - Adopted Value) | 0.025 mg/m³ (R) |
| Zinc oxide | Time-weighted average exposure limit 8 h (TLV - Adopted Value) | 2 mg/m³ (R) |
| | Short time value (TLV - Adopted Value) | 10 mg/m³ (R) |

(R): Respirable fraction
(I): Inhalable fraction

b) National biological limit values

If limit values are applicable and available these will be listed below.

**USA (BEI-ACGIH)**

| | | | |
|---|---|---|---|
| Cadmium and inorganic compounds (cadmium) | Blood: not critical | 5 µg/L | |
| Cadmium and inorganic compounds (cadmium) | urine: not critical | 5 µg/g creatine | |

**8.1.2 Sampling methods**

If applicable and available it will be listed below.

| | | |
|---|---|---|
| Aluminum & Compounds (as Al) | NIOSH | 7013 |
| Aluminum Oxide | OSHA | ID 109SG |
| Antimony & Compounds (as Sb) | NIOSH | 2(S2) |
| Antimony Particulates | NIOSH | 4(261) |
| Antimony | OSHA | ID 121 |
| Antimony | OSHA | ID 125G |
| Arsenic & Compounds (as As) | NIOSH | 7900 |
| Cadmium & Cpds (as Cd) | NIOSH | 7048 |
| Cadmium Oxide | NIOSH | 7048 |
| Calcium Oxide (Calcium) | NIOSH | 7020 |
| Copper Dust and fume | NIOSH | 7029 |
| Copper | OSHA | ID 121 |
| Copper | OSHA | ID 125G |
| Crystalline Silica | OSHA | ID 142 |
| Dialuminiumtrioxide | NIOSH | 7013 |
| elemental lead and lead compounds except alkyl lead | NIOSH | 7082 |
| elemental lead and lead compounds except alkyl lead | NIOSH | 7105 |
| Lead by ultrasound/ASV | NIOSH | 7701 |
| Lead | OSHA | ID 121 |
| Lead | OSHA | ID 125G |
| Manganese | OSHA | ID 121 |
| Manganese | OSHA | ID 125G |
| Quartz (silica, crystalline, by XRD) | NIOSH | 7500 |
| quartz | NIOSH | 7601 |
| quartz | NIOSH | 7602 |
| Silica, Crystalline, Respirable | NIOSH | 7500 |

| | | |
|---|---|---|
| Silica, Crystalline | NIOSH | 7601 |
| Silica, Crystalline | NIOSH | 7602 |
| Silica, Quartz in Coal Dust (Silica in coal mine dust) | NIOSH | 7603 |
| vary depending upon the compound: alumina | NIOSH | 8013 |
| vary depending upon the compound: Cu2O | NIOSH | 7029 |
| Zinc (Elements) | NIOSH | 7300 |
| Zinc Oxide | NIOSH | 7030 |
| Zinc Oxide | NIOSH | 7502 |
| Zinc Oxide | OSHA | ID 121 |

**8.1.3 Applicable limit values when using the substance or mixture as intended**

If limit values are applicable and available these will be listed below.

**8.1.4 DNEL/PNEC values**

**DNEL/DMEL - Workers**

zinc oxide

| Effect level (DNEL/DMEL) | Type | Value | Remark |
|---|---|---|---|
| DNEL | Long-term local effects inhalation | 0.5 mg/m³ | |
| | Long-term systemic effects inhalation | 5 mg/m³ | |
| | Long-term systemic effects dermal | 83 mg/kg bw/day | |

diantimony trioxide

| Effect level (DNEL/DMEL) | Type | Value | Remark |
|---|---|---|---|
| DNEL | Long-term local effects inhalation | 0.5 mg/m³ | |
| | Long-term systemic effects dermal | 281 mg/kg bw/day | |

manganese oxide

| Effect level (DNEL/DMEL) | Type | Value | Remark |
|---|---|---|---|
| DNEL | Long-term systemic effects dermal | 0.00414 mg/kg bw/day | |
| | Long-term systemic effects inhalation | 0.2 mg/m³ | |

aluminium oxide

| Effect level (DNEL/DMEL) | Type | Value | Remark |
|---|---|---|---|
| DNEL | Long-term local effects inhalation | 15.63 mg/m³ | |
| | Long-term systemic effects inhalation | 15.63 mg/m³ | |

calcium oxide

| Effect level (DNEL/DMEL) | Type | Value | Remark |
|---|---|---|---|
| DNEL | Long-term local effects inhalation | 1 mg/m³ | |
| | Acute local effects inhalation | 4 mg/m³ | |

**DNEL/DMEL - General population**

zinc oxide

| Effect level (DNEL/DMEL) | Type | Value | Remark |
|---|---|---|---|
| DNEL | Long-term systemic effects inhalation | 2.5 mg/m³ | |
| | Long-term systemic effects dermal | 83 mg/kg bw/day | |
| | Long-term systemic effects oral | 0.83 mg/kg bw/day | |

diantimony trioxide

| Effect level (DNEL/DMEL) | Type | Value | Remark |
|---|---|---|---|
| DNEL | Long-term local effects inhalation | 0.1 mg/m³ | |
| | Long-term systemic effects dermal | 168.6 mg/kg bw/day | |
| | Long-term systemic effects oral | 168.6 mg/kg bw/day | |

manganese oxide

| Effect level (DNEL/DMEL) | Type | Value | Remark |
|---|---|---|---|
| DNEL | Long-term systemic effects dermal | 0.0021 mg/kg bw/day | |
| | Long-term systemic effects inhalation | 0.043 mg/m³ | |

aluminium oxide

| Effect level (DNEL/DMEL) | Type | Value | Remark |
|---|---|---|---|
| DNEL | Long-term systemic effects oral | 6.58 mg/kg bw/day | |
| | Long-term systemic effects oral | 3.29 mg/kg bw/day | |

calcium oxide

| Effect level (DNEL/DMEL) | Type | Value | Remark |
|---|---|---|---|
| DNEL | Long-term local effects inhalation | 1 mg/m³ | |
| | Acute local effects inhalation | 4 mg/m³ | |

**PNEC**

zinc oxide

| Compartments | Value | Remark |
|---|---|---|
| Fresh water | 20.6 µg/l | |
| Marine water | 6.1 µg/l | |
| STP | 100 µg/l | |
| Fresh water sediment | 117.8 mg/kg sediment dw | |
| Marine water sediment | 56.5 mg/kg sediment dw | |
| Soil | 35.6 mg/kg soil dw | |

diantimony trioxide

| Compartments | Value | Remark |
|---|---|---|
| Fresh water | 0.113 mg/l | |
| Marine water | 0.011 mg/l | |
| STP | 2.55 mg/l | |
| Fresh water | 11.2 mg/kg sediment dw | |
| Marine water | 2.24 mg/kg sediment dw | |
| Soil | 37 mg/kg soil dw | |

manganese oxide

| Compartments | Value | Remark |
|---|---|---|
| Fresh water | 0.0084 mg/l | |
| Marine water | 0.00084 mg/l | |
| Aqua (intermittent releases) | 0.011 mg/l | |
| STP | 100 mg/l | |
| Fresh water sediment | 8.18 mg/kg sediment dw | |
| Marine water sediment | 0.82 mg/kg sediment dw | |
| Soil | 8.15 mg/kg soil dw | |

aluminium oxide

| Compartments | Value | Remark |
|---|---|---|
| Fresh water | 74.9 µg/l | |
| STP | 20 mg/l | |

calcium oxide

| Compartments | Value | Remark |
|---|---|---|
| Fresh water | 269 µg/l | |
| Marine water | 269 µg/l | |
| Aqua (intermittent releases) | 269 µg/l | |
| Soil | 810 mg/kg soil dw | |

**8.1.5 Control banding**

If applicable and available it will be listed below.

### 8.2. Exposure controls

The information in this section is a general description. If available, the documentation for isolated intermediates will be attached in annex to support safe handling arrangements.

**8.2.1 Appropriate engineering controls**

Avoid raising dust. Keep away from naked flames. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection.

**8.2.2 Individual protection measures, such as personal protective equipment**

Observe very strict hygiene - avoid contact. Keep container tightly closed. Do not eat, drink or smoke during work.

a) Respiratory protection:

Dust production: dust mask with filter type P3. High dust production: self-contained breathing apparatus.

b) Hand protection:

Gloves.

- materials (good resistance)

Acrylonitrile, PVC.

c) Eye protection:

Safety glasses. In case of dust production: protective goggles.

d) Skin protection:

Protective clothing. Dustproof clothing.

**8.2.3 Environmental exposure controls:**

See headings 6.2, 6.3 and 13

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

| | |
|---|---|
| Physical form | Solid |
| Odour | Odourless |
| Odour threshold | Not applicable |
| Colour | Brown |
| Particle size | D50 = <20 µm |
| Explosion limits | Not applicable |
| Flammability | Non combustible |
| Log Kow | Not applicable (mixture) |
| Dynamic viscosity | No data available |
| Kinematic viscosity | No data available |
| Melting point | No data available |
| Boiling point | No data available |
| Flash point | Not applicable |
| Evaporation rate | No data available |

| | |
|---|---|
| Relative vapour density | Not applicable |
| Vapour pressure | No data available |
| Solubility | No data available |
| Relative density | 5.17 ; 20 °C |
| Decomposition temperature | No data available |
| Auto-ignition temperature | Not applicable |
| Explosive properties | No chemical group associated with explosive properties |
| Oxidising properties | No chemical group associated with oxidising properties |
| pH | No data available |

### 9.2. Other information

| | |
|---|---|
| Absolute density | 5170 kg/m³ ; 20 °C |

## SECTION 10: Stability and reactivity

### 10.1. Reactivity

No data available.

### 10.2. Chemical stability

Stable under normal conditions.

### 10.3. Possibility of hazardous reactions

No data available.

### 10.4. Conditions to avoid

Avoid raising dust. Keep away from naked flames.

### 10.5. Incompatible materials

Oxidizing agents, (strong) acids.

### 10.6. Hazardous decomposition products

On burning: release of harmful/irritant gases/vapours and formation of metallic fumes.

## SECTION 11: Toxicological information

### 11.1. Information on toxicological effects

#### 11.1.1 Test results

**Acute toxicity**

zinc calcine

No (test)data available

zinc oxide

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Oral | LD50 | Equivalent to OECD 401 | > 5000 mg/kg | | Rat (male/female) | Experimental value | |
| Dermal | LD50 | OECD 402 | > 2000 mg/kg bw | 24 h | Rat (male/female) | Experimental value | |
| Inhalation (dust) | LC50 | Equivalent to OECD 403 | > 5.7 mg/l | 4 h | Rat (male/female) | Experimental value | |

copper oxide

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Oral | LD50 | OECD 423 | > 2500 mg/kg | | Rat (male) | Experimental value | |

cadmium oxide (non-pyrophoric)

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Inhalation (aerosol) | LC50 | | 0.056 mg/l(Cd 2+) | 4 h | Rat (male/female) | Read-across | |

lead monoxide

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Oral | | | category 4 | | | Literature study | |
| Inhalation | | | category 4 | | | Literature study | |

iron arsenate

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Oral | LD50 | Equivalent to OECD 401 | 149.6 mg/kg bw | | Mouse (male/female) | Read-across | |
| Inhalation (aerosol) | LC50 | Equivalent to OECD 403 | 1.04 mg/l | 4 h | Mouse (male/female) | Read-across | |

diantimony trioxide

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Oral | LD50 | | > 20000 mg/kg | | Rat | Experimental value | |
| Dermal | LD50 | | > 8300 mg/kg bw | | Rabbit | Experimental value | |
| Inhalation (aerosol) | LC50 | OECD 403 | > 5.2 mg/l air | 4 h | Rat (male/female) | Experimental value | |

aluminium oxide

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Oral | LD50 | Equivalent to OECD 401 | > 15900 mg/kg bw | | Rat (male/female) | Experimental value | |
| Dermal | | | | | | Data waiving | |
| Inhalation (aerosol) | LC50 | Equivalent to OECD 403 | 7.6 mg/l air | 1 h | Rat (male) | Experimental value | |

calcium oxide

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Oral | LD50 | OECD 425 | > 2000 mg/kg bw | | Rat (female) | Experimental value | |
| Dermal | LD50 | EU Method B.3 | > 2500 mg/kg bw | 24 h | Rabbit (male/female) | Experimental value | |
| Inhalation | | | | | | Data waiving | |

magnesium oxide

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Oral | LD50 | | > 5000 mg/kg | | Rat | Literature study | |
| Dermal | LD50 | | > 2000 mg/kg bw | | Rabbit | Literature study | |

Judgement is based on the relevant ingredients

**Conclusion**

Not classified for acute toxicity

**Corrosion/irritation**

zinc calcine

No (test)data available

zinc oxide

| Route of exposure | Result | Method | Exposure time | Time point | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Eye | Not irritating | OECD 405 | 24 h | 24; 72 hours | Rabbit | Experimental value | |
| Skin | Not irritating | OECD 404 | 24 h | 24 hours | Rabbit | Experimental value | |
| Not applicable (in vitro test) | Not corrosive | OECD 431 | 3 minutes | 24; 72 hours | Reconstructed human epidermis | Experimental value | |

copper oxide

| Route of exposure | Result | Method | Exposure time | Time point | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Eye | Not irritating | OECD 405 | 72 h | 24; 48; 72 hours | Rabbit | Experimental value | |

diantimony trioxide

| Route of exposure | Result | Method | Exposure time | Time point | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Eye | Not irritating | OECD 405 | | 24; 48; 72 hours | Rabbit | Experimental value | |
| Skin | Not irritating | | 1 week(s) | | Rabbit | Experimental value | |

aluminium oxide

| Route of exposure | Result | Method | Exposure time | Time point | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Eye | Not irritating | Equivalent to OECD 405 | | 24; 48; 72 hrs; 4; 7 days | Rabbit | Experimental value | |
| Skin | Not irritating | Equivalent to OECD 404 | 24 h | 24; 48; 72 hours | Rabbit | Experimental value | |

calcium oxide

| Route of exposure | Result | Method | Exposure time | Time point | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Eye | Serious eye damage | OECD 405 | | 1 hour | Rabbit | Experimental value | |
| Skin | Irritating | OECD 404 | 4 h | 1; 24; 48; 72 hours | Rabbit | Read-across | |
| Inhalation | Irritating | Human | | | Human | Experimental value | |

Classification is based on the relevant ingredients

**Conclusion**

Causes serious eye damage.

Not classified as irritating to the skin

Not classified as irritating to the respiratory system

**Respiratory or skin sensitisation**

zinc calcine

No (test)data available

zinc oxide

| Route of exposure | Result | Method | Exposure time | Observation time point | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Skin | Not sensitizing | OECD 406 | | | Guinea pig (female) | Experimental value | |
| Skin | Not sensitizing | Human observation | 2 days | 72 hours | Human | Experimental value | |

diantimony trioxide

| Route of exposure | Result | Method | Exposure time | Observation time point | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Skin | Not sensitizing | OECD 406 | | 48; 72 hours | Guinea pig (female) | Experimental value | |

aluminium oxide

| Route of exposure | Result | Method | Exposure time | Observation time point | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Dermal | Not sensitizing | Other | | 24 hours | Guinea pig (male) | Experimental value | |
| Intratracheal instillation | Not sensitizing | | | | Mouse (male) | Weight of evidence | |

calcium oxide

| Route of exposure | Result | Method | Exposure time | Observation time point | Species | Value determination | Remark |
|---|---|---|---|---|---|---|---|
| Skin | | | | | | Data waiving | |

Judgement is based on the relevant ingredients

**Conclusion**

Not classified as sensitizing for skin

Not classified as sensitizing for inhalation

**Specific target organ toxicity**

zinc calcine

No (test)data available

zinc oxide

| Route of exposure | Parameter | Method | Value | Organ | Effect | Exposure time | Species | Value determination |
|---|---|---|---|---|---|---|---|---|
| Oral (diet) | NOEL | OECD 408 | 3000 ppm | | No effect | 13 weeks (daily) | Rat (male/female) | Read-across |
| Inhalation (aerosol) | NOAEL | OECD 413 | 1.5 mg/m³ air | | No effect | 13 weeks (6h/day, 5 days/week) | Rat (male) | Experimental value |

cadmium oxide (non-pyrophoric)

| Route of exposure | Parameter | Method | Value | Organ | Effect | Exposure time | Species | Value determination |
|---|---|---|---|---|---|---|---|---|
| Oral | NOAEL | Other | 3 mg/kg bw/day | | No effect | 3 month(s) | Rat (male/female) | Read-across |
| Inhalation (aerosol) | LOAEL | Equivalent to OECD 413 | 0.05 mg/m³ air | Lungs | Overall effects | 13 week(s) | Rat (male/female) | Experimental value |

lead monoxide

| Route of exposure | Parameter | Method | Value | Organ | Effect | Exposure time | Species | Value determination |
|---|---|---|---|---|---|---|---|---|
| Oral | | | STOT RE cat.2 | | | | | Literature study |
| Inhalation | | | STOT RE cat.2 | | | | | Literature study |

diantimony trioxide

| Route of exposure | Parameter | Method | Value | Organ | Effect | Exposure time | Species | Value determination |
|---|---|---|---|---|---|---|---|---|
| Oral (diet) | NOAEL | Equivalent to OECD 408 | 1879 mg/kg bw/day | | No effect | 90 day(s) | Rat (female) | Experimental value |
| Oral (diet) | NOAEL | Equivalent to OECD 408 | 1686 mg/kg bw/day | | No effect | 90 day(s) | Rat (male) | Experimental value |
| Dermal | | | | | | | | Data waiving |
| Inhalation (dust) | NOAEC | Equivalent to OECD 452 | ≥ 0.51 mg/m³ air | | No effect | 52 weeks (6h/day, 5 days/week) | Rat (male/female) | Experimental value |
| Inhalation (dust) | LOAEC | Equivalent to OECD 452 | ≥ 4.5 mg/m³ air | Lungs | Lung tissue affection/degeneration | 52 weeks (6h/day, 5 days/week) | Rat (male/female) | Experimental value |

quartz (SiO2)

| Route of exposure | Parameter | Method | Value | Organ | Effect | Exposure time | Species | Value determination |
|---|---|---|---|---|---|---|---|---|
| Inhalation (dust) | | | STOT RE cat.2 | | | | | Literature study |

aluminium oxide

| Route of exposure | Parameter | Method | Value | Organ | Effect | Exposure time | Species | Value determination |
|---|---|---|---|---|---|---|---|---|
| Oral (drinking water) | NOAEL | Equivalent to OECD 452 | 322.5 mg/kg bw/day | | No effect | 51 weeks (daily) | Rat (male/female) | Read-across |
| Oral (diet) | NOAEL | Equivalent to OECD 407 | 302 mg/kg bw/day | | No effect | 4 weeks (daily) | Rat (male) | Read-across |
| Oral (diet) | NOAEL | Equivalent to OECD 409 | 90 mg/kg bw/day | | No effect | 26 weeks (daily) | Dog (male/female) | Read-across |
| Inhalation (dust) | NOAEC | Equivalent to OECD 413 | 70 mg/m³ air | | No effect | 26 weeks (6h/day, 5 days/week) - 52 weeks (6h/day, 5 days/week) | Rat | Experimental value |

calcium oxide

| Route of exposure | Parameter | Method | Value | Organ | Effect | Exposure time | Species | Value determination |
|---|---|---|---|---|---|---|---|---|
| Oral (diet) | Dose level | | 2.5 % | | No adverse systemic effects | 52 week(s) | Rat (male) | Experimental value |
| Dermal | | | | | | | | Data waiving |
| Inhalation | | | | | | | | Data waiving |

Classification is based on the relevant ingredients

**Conclusion**

May cause damage to organs (blood system, central nervous system, lungs, kidneys) through prolonged or repeated exposure if swallowed and if inhaled (major route).

Not classified as sub-chronically toxic in contact with skin

**Mutagenicity (in vitro)**

zinc calcine

No (test)data available

zinc oxide

| Result | Method | Test substrate | Effect | Value determination |
|---|---|---|---|---|
| Negative with metabolic activation, negative without metabolic activation | Equivalent to OECD 471 | Bacteria (S.typhimurium) | No effect | Experimental value |

cadmium oxide (non-pyrophoric)

| Result | Method | Test substrate | Effect | Value determination |
|---|---|---|---|---|
| Positive | Equivalent to OECD 473 | Chinese hamster ovary (CHO) | Chromosome aberrations | Experimental value |

diantimony trioxide

| Result | Method | Test substrate | Effect | Value determination |
|---|---|---|---|---|
| Positive with metabolic activation, positive without metabolic activation | OECD 473 | Human lymphocytes | | Experimental value |
| Negative with metabolic activation, negative without metabolic activation | OECD 471 | Bacteria (S.typhimurium) | No effect | Experimental value |
| Negative with metabolic activation, negative without metabolic activation | OECD 476 | Mouse (lymphoma L5178Y cells) | No effect | Experimental value |

aluminium oxide

| Result | Method | Test substrate | Effect | Value determination |
|---|---|---|---|---|
| Negative with metabolic activation, negative without metabolic activation | OECD 476 | Mouse (lymphoma L5178Y cells) | | Read-across |
| Positive without metabolic activation | | Human lymphocytes | | Read-across |
| Positive without metabolic activation | Other | Human lymphocytes | | Read-across |

calcium oxide

| Result | Method | Test substrate | Effect | Value determination |
|---|---|---|---|---|
| Negative with metabolic activation, negative without metabolic activation | OECD 471 | Bacteria (S.typhimurium) | No effect | Experimental value |

**Mutagenicity (in vivo)**

zinc calcine

No (test)data available

zinc oxide

| Result | Method | Exposure time | Test substrate | Organ | Value determination |
|---|---|---|---|---|---|
| Negative | OECD 474 | | Mouse (male) | Bone marrow | Experimental value |

diantimony trioxide

| Result | Method | Exposure time | Test substrate | Organ | Value determination |
|---|---|---|---|---|---|
| Negative | OECD 474 | | Mouse (male/female) | | Experimental value |

aluminium oxide

| Result | Method | Exposure time | Test substrate | Organ | Value determination |
|---|---|---|---|---|---|
| Negative | OECD 474 | 24 h | Rat (male) | | Read-across |

**Carcinogenicity**

zinc calcine

No (test)data available

cadmium oxide (non-pyrophoric)

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Effect | Organ | Value determination |
|---|---|---|---|---|---|---|---|---|
| Inhalation (aerosol) | LOAEL | Carcinogenic toxicity study | 0.03 mg/m³ air | 18 month(s) | Rat (male/female) | Tumor formation | Lungs | Experimental value |

iron arsenate

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Effect | Organ | Value determination |
|---|---|---|---|---|---|---|---|---|
| Oral (drinking water) | Dose level | Carcinogenic toxicity study | 42.5 ppm - 85 ppm | 8 days (gestation, daily) - 18 days (gestation, daily) | Mouse (male/female) | Tumor formation | Various organs | Read-across |

diantimony trioxide

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Effect | Organ | Value determination |
|---|---|---|---|---|---|---|---|---|
| Inhalation (dust) | NOAEC | Equivalent to OECD 451 | > 4.5 mg/m³ air | 52 weeks (6h/day, 5 days/week) | Rat (male/female) | No carcinogenic effect | | Experimental value |
| Inhalation (dust) | LOAEC | | 45 mg/m³ air | 52 weeks (5 days/week) | Rat (male/female) | Neoplastic effects | | Experimental value |

aluminium oxide

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Effect | Organ | Value determination |
|---|---|---|---|---|---|---|---|---|
| Inhalation (dust) | | Not determined | 2.45 mg/m³ | 86 weeks (6h/day, 5 days/week) | Rat (male/female) | No carcinogenic effect | | Weight of evidence |
| Inhalation | | Not determined | 0 mg/m³ - 13.2 mg/m³ | 1 year(s) | Human (male) | Mortality | | Weight of evidence |

calcium oxide

| Route of exposure | Parameter | Method | Value | Exposure time | Species | Effect | Organ | Value determination |
|---|---|---|---|---|---|---|---|---|
| Oral (drinking water) | NOAEL | Not determined | 279.5 mg/kg bw/day | 104 week(s) | Rat (male) | No carcinogenic effect | | Read-across |
| Oral (drinking water) | NOAEL | Not determined | 296.4 mg/kg bw/day | 104 week(s) | Rat (female) | No carcinogenic effect | | Read-across |

**Reproductive toxicity**

zinc calcine

No (test)data available

zinc oxide

| | Parameter | Method | Value | Exposure time | Species | Effect | Organ | Value determination |
|---|---|---|---|---|---|---|---|---|
| Developmental toxicity | NOAEC | OECD 414 | 7.5 mg/kg bw/day | 14 days (6h/day) | Rat | No effect | Foetus | Experimental value |
| Maternal toxicity | NOAEC | OECD 414 | 7.5 mg/kg bw/day | 14 days (6h/day) | Rat | No effect | | Experimental value |
| Effects on fertility | NOAEL (F1) | Equivalent to OECD 416 | 7.5 mg/kg bw/day | 22 weeks (daily) | Rat (male/female) | No effect | | Read-across |

cadmium oxide (non-pyrophoric)

| | Parameter | Method | Value | Exposure time | Species | Effect | Organ | Value determination |
|---|---|---|---|---|---|---|---|---|
| Developmental toxicity | LOAEL | OECD 414 | 2 mg/m³ air | 4 days (gestation, daily) - 19 days (gestation, daily) | Rat (female) | Maternal toxicity | | Experimental value |
| Effects on fertility | LOAEL (P) | Equivalent to OECD 408 | 1 mg/m³ air | 13 week(s) | Rat (male/female) | Prolonged oestrus stages | | Experimental value |

lead monoxide

| | Parameter | Method | Value | Exposure time | Species | Effect | Organ | Value determination |
|---|---|---|---|---|---|---|---|---|
| Developmental toxicity | | | category 1A | | | | | Literature study |
| Effects on fertility | | | category 2 | | | | | Literature study |

diantimony trioxide

| | Parameter | Method | Value | Exposure time | Species | Effect | Organ | Value determination |
|---|---|---|---|---|---|---|---|---|
| Developmental toxicity | NOEC | OECD 414 | 6.3 mg/m³ air | 20 days (6h/day) | Rat | No effect | | Experimental value |
| Maternal toxicity | LOAEC | OECD 414 | 2.6 mg/m³ air | 20 days (6h/day) | Rat | Weight gain | Lungs | Experimental value |
| Effects on fertility | NOAEL | | 1879 mg/kg bw/day | 90 day(s) | Rat (female) | No effect | Female reproductive organ | Experimental value |
| | NOAEL | | 1686 mg/kg bw/day | 90 day(s) | Rat (male) | No effect | Male reproductive organ | Experimental value |

aluminium oxide

| | Parameter | Method | Value | Exposure time | Species | Effect | Organ | Value determination |
|---|---|---|---|---|---|---|---|---|
| Developmental toxicity | NOAEL | Equivalent to OECD 414 | 266 mg/kg bw/day | 10 day(s) | Rat | No effect | | Read-across |
| Maternal toxicity | NOAEL (P) | Other | 3225 mg/kg bw/day | > 52 weeks (daily) | Rat (female) | No effect | | Read-across |
| Effects on fertility | NOAEL (P) | Equivalent to OECD 426 | 3225 mg/kg bw/day | > 52 weeks (daily) | Rat (female) | No effect | | Read-across |
| | LOAEL | OECD 422 | 1000 mg/kg bw | 28 day(s) - 53 day(s) | Rat (male/female) | Irritation of the gastric/intestinal mucosa | | Read-across |

calcium oxide

| | Parameter | Method | Value | Exposure time | Species | Effect | Organ | Value determination |
|---|---|---|---|---|---|---|---|---|
| Developmental toxicity | NOAEL | Equivalent to OECD 414 | 680 mg/kg bw/day | 10 day(s) | Rat (female) | No effect | | Experimental value |

Classification is based on the relevant ingredients

**Conclusion CMR**

May cause cancer by inhalation.
May damage the unborn child. Suspected of damaging fertility.
Not classified for mutagenic or genotoxic toxicity

**Toxicity other effects**

zinc calcine

No (test)data available

**Chronic effects from short and long-term exposure**

zinc calcine

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Gastrointestinal complaints. Abdominal pain. Nausea. Loss of appetite. Loss of weight. Feeling of weakness. Paleness. Metal taste. Discolouration of the gums. Affection of the renal tissue. Change in urine output. Change in urine composition. Headache. Dizziness. Impairment of the nervous system. Brain affection. Excited/restless. Behavioural disturbances. Emotional instability. Sleeplessness. Impaired memory. Mental confusion. Delusions. Myasthenia. Coordination disorders. Disturbed motor response. Disturbed tactile sensibility. Tremor. Cramps/uncontrolled muscular contractions. Paralysis. Change in the haemogramme/blood composition. Possible premature birth.

## SECTION 12: Ecological information

### 12.1. Toxicity

zinc calcine

No (test)data available

zinc oxide

| | Parameter | Method | Value | Duration | Species | Test design | Fresh/salt water | Value determination |
|---|---|---|---|---|---|---|---|---|
| Acute toxicity fishes | LC50 | ASTM E729-88 | 0.169 mg/l | 96 h | Oncorhynchus mykiss | Static system | Fresh water | Read-across; Zinc ion |
| Acute toxicity invertebrates | EC50 | OECD 202 | 1 mg/l | 48 h | Daphnia magna | Static system | Fresh water | Experimental value; Zinc ion |
| Toxicity algae and other aquatic plants | IC50 | OECD 201 | 0.136 mg/l | 72 h | Pseudokirchneriella subcapitata | Static system | Fresh water | Experimental value; Zinc ion |
| | NOEC | OECD 201 | 0.024 mg/l | 3 day(s) | Pseudokirchneriella subcapitata | Static system | Fresh water | Experimental value; Zinc ion |
| Long-term toxicity fish | NOEC | OECD 215 | 0.039 mg/l | 30 day(s) | Oncorhynchus mykiss | Flow-through system | Fresh water | Read-across; Zinc ion |
| Long-term toxicity aquatic invertebrates | NOEC | OECD 211 | 0.04 mg/l | 21 day(s) | Daphnia magna | Semi-static system | Fresh water | Read-across; Zinc ion |
| Toxicity aquatic micro-organisms | EC50 | OECD 209 | > 1000 mg/l | 3 h | Activated sludge | Static system | Fresh water | Experimental value; GLP |

copper oxide

| | Parameter | Method | Value | Duration | Species | Test design | Fresh/salt water | Value determination |
|---|---|---|---|---|---|---|---|---|
| Acute toxicity fishes | LC50 | APHA | 0.093 mg/l | 96 h | Oncorhynchus mykiss | Flow-through system | Fresh water | Weight of evidence |
| Acute toxicity invertebrates | EC50 | OECD 202 | 0.109 mg/l | 48 h | Daphnia magna | Static system | Fresh water | Weight of evidence |
| Toxicity algae and other aquatic plants | EC50 | OECD 201 | 0.047 mg/l | 96 h | Chlamydomonas reinhardtii | Flow-through system | Fresh water | Weight of evidence |
| | EC50 | OECD 201 | 0.032 mg/l | 10 day(s) | Chlamydomonas reinhardtii | Flow-through system | Fresh water | Weight of evidence |
| Long-term toxicity fish | NOEC | OECD 204 | 0.024 mg/l | 61 day(s) | Oncorhynchus mykiss | Flow-through system | Fresh water | Weight of evidence |
| Long-term toxicity aquatic invertebrates | NOEC | Other | 0.0126 mg/l | 21 day(s) | Daphnia magna | | Fresh water | Weight of evidence |

cadmium oxide (non-pyrophoric)

| | Parameter | Method | Value | Duration | Species | Test design | Fresh/salt water | Value determination |
|---|---|---|---|---|---|---|---|---|
| Acute toxicity fishes | LC50 | Other | 1.5 mg/l | 96 h | Pimephales promelas | Flow-through system | Fresh water | Read-across |
| Acute toxicity invertebrates | LC50 | OECD 202 | 750 µg/l | 48 h | Daphnia magna | Static system | Fresh water | Experimental value |
| Toxicity algae and other aquatic plants | ErC50 | OECD 201 | 18 µg/l | 72 h | Pseudokirchneriella subcapitata | Static system | Fresh water | Experimental value |
| | EC50 | | 0.079 mg/l | 72 h | Selenastrum capricornutum | | | Cadmium ion |

lead monoxide

| | Parameter | Method | Value | Duration | Species | Test design | Fresh/salt water | Value determination |
|---|---|---|---|---|---|---|---|---|
| Acute toxicity fishes | TLm | | 7.48 mg/l | 96 h | Pimephales promelas | | | Lead ion |
| Acute toxicity invertebrates | LC50 | | 0.3 mg/l | 48 h | Daphnia magna | | | Lead ion |
| Toxicity algae and other aquatic plants | EC50 | | 0.14 mg/l | | Selenastrum capricornutum | | | Lead ion |

iron arsenate

| | Parameter | Method | Value | Duration | Species | Test design | Fresh/salt water | Value determination |
|---|---|---|---|---|---|---|---|---|
| Acute toxicity fishes | LC50 | Equivalent to OECD 203 | 28 mg/l | 96 h | Cyprinodon variegatus | Static system | Salt water | Read-across |
| Acute toxicity invertebrates | LC50 | APHA | 3.26 mg/l | 48 h | Daphnia pulex | Static system | Fresh water | Read-across |
| Toxicity algae and other aquatic plants | ErC50 | Equivalent to OECD 201 | 0.159 mg/l | 96 h | Scenedesmus obliquus | Semi-static system | Fresh water | Read-across |

aluminium oxide

| | Parameter | Method | Value | Duration | Species | Test design | Fresh/salt water | Value determination |
|---|---|---|---|---|---|---|---|---|
| Acute toxicity fishes | NOEC | OECD 203 | > 100 mg/l | 96 h | Salmo trutta | Flow-through system | Fresh water | Experimental value; GLP |
| Acute toxicity invertebrates | NOEC | OECD 202 | > 100 mg/l | 48 h | Daphnia magna | | | Experimental value; GLP |
| Toxicity algae and other aquatic plants | NOEC | OECD 201 | > 100 mg/l | 72 h | Selenastrum capricornutum | | | Experimental value; GLP |

calcium oxide

| | Parameter | Method | Value | Duration | Species | Test design | Fresh/salt water | Value determination |
|---|---|---|---|---|---|---|---|---|
| Acute toxicity fishes | LC50 | Equivalent to OECD 203 | ≥ 1070 mg/l | 96 h | Cyprinus carpio | Static system | Fresh water | Experimental value; Nominal concentration |
| Acute toxicity invertebrates | EC50 | EPA OPP 72-2 | ≥ 159.6 mg/l | 24 h | Crustacea | Static system | Fresh water | Experimental value; Lethal |
| Toxicity algae and other aquatic plants | EC50 | OECD 201 | 184.57 mg/l | 72 h | Pseudokirchneriella subcapitata | Static system | Fresh water | Read-across; Growth rate |
| Long-term toxicity fish | | | | | | | | Data waiving |
| Long-term toxicity aquatic invertebrates | NOEC | | 32 mg/l | 14 day(s) | Crangon sp. | Semi-static system | Salt water | Read-across |
| Toxicity aquatic micro-organisms | EC50 | OECD 209 | 300.4 mg/l | 3 h | Activated sludge | Static system | Fresh water | Read-across; GLP |

magnesium oxide

| | Parameter | Method | Value | Duration | Species | Test design | Fresh/salt water | Value determination |
|---|---|---|---|---|---|---|---|---|
| Acute toxicity invertebrates | TLM | | 500 ppm - 665 ppm | 96 h | Mysidacea | | | Literature study |

Classification is based on the relevant ingredients

**Conclusion**

Very toxic to aquatic life with long lasting effects.

## 12.2. Persistence and degradability

Biodegradability: not applicable

## 12.3. Bioaccumulative potential

zinc calcine

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | Not applicable (mixture) | | | |

zinc oxide

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | | 1.53 | | Estimated value |

copper oxide

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | No data available | | | |

zinc ferrite brown spinel

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | No data available | | | |

cadmium oxide (non-pyrophoric)

**BCF fishes**

| Parameter | Method | Value | Duration | Species | Value determination |
|---|---|---|---|---|---|
| BCF | | 4.2 - 57 | | Cyprinus carpio | |

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | No data available | | | |

lead monoxide

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | No data available | | | |

iron arsenate

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | No data available | | | |

diantimony trioxide

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | No data available | | | |

quartz (SiO2)

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | No data available | | | |

manganese oxide

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | No data available | | | |

aluminium oxide

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | No data available | | | |

calcium oxide

**BCF other aquatic organisms**

| Parameter | Method | Value | Duration | Species | Value determination |
|---|---|---|---|---|---|
| | | | | | Data waiving |

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | No data available | | | |

magnesium oxide

**Log Kow**

| Method | Remark | Value | Temperature | Value determination |
|---|---|---|---|---|
| | No data available | | | |

**Conclusion**

Contains bioaccumulative component(s)

### 12.4. Mobility in soil

zinc oxide

**(log) Koc**

| Parameter | Method | Value | Value determination |
|---|---|---|---|
| log Koc | | 2.2 | Literature study |

**Conclusion**

Contains component(s) with potential for mobility in the soil

Contains component(s) that adsorb(s) into the soil

### 12.5. Results of PBT and vPvB assessment

The criteria of PBT and vPvB as listed in Annex XIII of Regulation (EC) No 1907/2006 do not apply to inorganic substances.

### 12.6. Other adverse effects

zinc calcine

**Fluorinated greenhouse gases (Regulation (EU) No 517/2014)**

None of the known components is included in the list of fluorinated greenhouse gases (Regulation (EU) No 517/2014)

**Ozone-depleting potential (ODP)**

Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009)

zinc oxide

**Ground water**

Ground water pollutant

## SECTION 13: Disposal considerations

The information in this section is a general description. If available, the documentation for isolated intermediates will be attached in annex to support safe handling arrangements.

### 13.1. Waste treatment methods

**13.1.1 Provisions relating to waste**

Hazardous waste according to Directive 2008/98/EC, as amended by Regulation (EU) No 1357/2014.
Waste material code (Directive 2008/98/EC, Decision 2000/0532/EC).
06 03 13* (wastes from the MFSU of salts and their solutions and metallic oxides: solid salts and solutions containing heavy metals). Depending on branch of industry and production process, also other waste codes may be applicable.

**13.1.2 Disposal methods**

Recycle/reuse. Remove to an authorized dump (Class I). Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Do not discharge into surface water (Directive 2000/60/EC, Council Decision 2455/2001/EC).

**13.1.3 Packaging/Container**

Waste material code packaging (Directive 2008/98/EC).
15 01 10* (packaging containing residues of or contaminated by dangerous substances).

## SECTION 14: Transport information

### Road (ADR)

14.1. UN number

| | |
|---|---|
| UN number | 3077 |

14.2. UN proper shipping name

| | |
|---|---|
| Proper shipping name | Environmentally hazardous substance, solid, n.o.s. (zinc oxide) |

14.3. Transport hazard class(es)

| | |
|---|---|
| Hazard identification number | 90 |
| Class | 9 |
| Classification code | M7 |

14.4. Packing group

| | |
|---|---|
| Packing group | III |
| Labels | 9 |

14.5. Environmental hazards

| | |
|---|---|
| Environmentally hazardous substance mark | yes |

14.6. Special precautions for user

| | |
|---|---|
| Special provisions | 274 |
| Special provisions | 335 |
| Special provisions | 375 |
| Special provisions | 601 |
| Limited quantities | Combination packagings: not more than 5 kg per inner packaging for solids. A package shall not weigh more than 30 kg. (gross mass) |

### Rail (RID)

14.1. UN number

| | |
|---|---|
| UN number | 3077 |

14.2. UN proper shipping name

| | |
|---|---|
| Proper shipping name | Environmentally hazardous substance, solid, n.o.s. (zinc oxide) |

14.3. Transport hazard class(es)

| | |
|---|---|
| Hazard identification number | 90 |
| Class | 9 |
| Classification code | M7 |

14.4. Packing group

| | |
|---|---|
| Packing group | III |
| Labels | 9 |

14.5. Environmental hazards

| | |
|---|---|
| Environmentally hazardous substance mark | yes |

14.6. Special precautions for user

| | |
|---|---|
| Special provisions | 274 |
| Special provisions | 335 |
| Special provisions | 375 |
| Special provisions | 601 |
| Limited quantities | Combination packagings: not more than 5 kg per inner packaging for solids. A package shall not weigh more than 30 kg. (gross mass) |

### Inland waterways (ADN)

14.1. UN number

| | |
|---|---|
| UN number | 3077 |

14.2. UN proper shipping name

| | |
|---|---|
| Proper shipping name | Environmentally hazardous substance, solid, n.o.s. (zinc oxide) |

14.3. Transport hazard class(es)

| | |
|---|---|
| Class | 9 |
| Classification code | M7 |

14.4. Packing group

| | |
|---|---|
| Packing group | III |
| Labels | 9 |

14.5. Environmental hazards

| | |
|---|---|
| Environmentally hazardous substance mark | yes |

14.6. Special precautions for user

| | |
|---|---|
| Special provisions | 274 |
| Special provisions | 335 |
| Special provisions | 375 |
| Special provisions | 601 |
| Limited quantities | Combination packagings: not more than 5 kg per inner packaging for solids. A package shall not weigh more than 30 kg. (gross mass) |

### Sea (IMDG/IMSBC)

14.1. UN number

| | |
|---|---|
| UN number | 3077 |

14.2. UN proper shipping name

| | |
|---|---|
| Proper shipping name | Environmentally hazardous substance, solid, n.o.s. (zinc oxide) |

14.3. Transport hazard class(es)

| | |
|---|---|
| Class | 9 |

14.4. Packing group

| | |
|---|---|
| Packing group | III |
| Labels | 9 |

14.5. Environmental hazards

| | |
|---|---|
| Marine pollutant | P |
| Environmentally hazardous substance mark | yes |

14.6. Special precautions for user

| | |
|---|---|
| Special provisions | 274 |
| Special provisions | 335 |
| Special provisions | 966 |
| Special provisions | 967 |
| Special provisions | 969 |
| Limited quantities | Combination packagings: not more than 5 kg per inner packaging for solids. A package shall not weigh more than 30 kg. (gross mass) |

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

| | |
|---|---|
| Annex II of MARPOL 73/78 | Not applicable |

### Air (ICAO-TI/IATA-DGR)

14.1. UN number

| | |
|---|---|
| UN number | 3077 |

14.2. UN proper shipping name

| | |
|---|---|
| Proper shipping name | Environmentally hazardous substance, solid, n.o.s. (zinc oxide) |

14.3. Transport hazard class(es)

| | |
|---|---|
| Class | 9 |

14.4. Packing group

| | |
|---|---|
| Packing group | III |
| Labels | 9 |

14.5. Environmental hazards

| | |
|---|---|
| Environmentally hazardous substance mark | yes |

14.6. Special precautions for user

| | |
|---|---|
| Special provisions | A97 |
| Special provisions | A158 |
| Special provisions | A179 |
| Special provisions | A197 |
| Passenger and cargo transport: limited quantities: maximum net quantity per packaging | 30 kg G |

## SECTION 15: Regulatory information

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

**European legislation:**

VOC content Directive 2010/75/EU

| VOC content | Remark |
|---|---|
| | Not applicable (inorganic) |

Plant protection products - listed ingredient

Contains component(s) included in implementing Regulation (EU) No 540/2011

European drinking water standards (Directive 98/83/EC)

copper oxide

| Parameter | Parametric value | Note | Reference |
|---|---|---|---|
| Copper | 2 mg/l | | Listed in Annex I, Part B, of Directive 98/83/EC on the quality of water intended for human consumption. |

cadmium oxide (non-pyrophoric)

| Parameter | Parametric value | Note | Reference |
|---|---|---|---|
| Cadmium | 5 µg/l | | Listed in Annex I, Part B, of Directive 98/83/EC on the quality of water intended for human consumption. |

lead monoxide

| Parameter | Parametric value | Note | Reference |
|---|---|---|---|
| Lead | 10 µg/l | | Listed in Annex I, Part B, of Directive 98/83/EC on the quality of water intended for human consumption. |

iron arsenate

| Parameter | Parametric value | Note | Reference |
|---|---|---|---|
| Arsenic | 10 µg/l | | Listed in Annex I, Part B, of Directive 98/83/EC on the quality of water intended for human consumption. |
| Iron | 200 µg/l | | Listed in Annex I, Part C, of Directive 98/83/EC on the quality of water intended for human consumption. |

diantimony trioxide

| Parameter | Parametric value | Note | Reference |
|---|---|---|---|
| Antimony | 5 µg/l | | Listed in Annex I, Part B, of Directive 98/83/EC on the quality of water intended for human consumption. |

manganese oxide

| Parameter | Parametric value | Note | Reference |
|---|---|---|---|
| Manganese | 50 µg/l | | Listed in Annex I, Part C, of Directive 98/83/EC on the quality of water intended for human consumption. |

aluminium oxide

| Parameter | Parametric value | Note | Reference |
|---|---|---|---|
| Aluminium | 200 µg/l | | Listed in Annex I, Part C, of Directive 98/83/EC on the quality of water intended for human consumption. |

REACH registration

This substance is handled under Strictly Controlled Conditions in accordance with Reach regulation Article 17(3) for on-site isolated intermediates and, in case the substance is transported to other sites for further processing, the substance should be handled at these sites under Strictly Controlled Conditions as specified in Reach regulation Article 18(4). Site documentation to support safe handling arrangements including the selection of engineering, administrative and personal protective equipment controls in accordance with risk based management systems is available at each manufacturing site. Written confirmation of application of Strictly Controlled Conditions should be available at the premises of every affected Distributor and Downstream Processor/User of the Registrants' intermediate.

Information exposure scenarios

This safety data sheet does not contain an exposure scenario; exempted as (isolated) intermediate

REACH Candidate list

Contains component(s) included in candidate list of substances of very high concern (SVHC) for authorisation (Article 59 of Regulation (EC) No 1907/2006)

REACH Annex XVII - Restriction

Contains component(s) subject to restrictions of Annex XVII of Regulation (EC) No 1907/2006: restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

| | Designation of the substance, of the group of substances or of the mixture | Conditions of restriction |
|---|---|---|
| · iron arsenate | Arsenic compounds | 1.Shall not be placed on the market, or used, as substances or in mixtures where the substance or mixture is intended for use to prevent the fouling by micro-organisms, plants or animals of:<br>— the hulls of boats,<br>— cages, floats, nets and any other appliances or equipment used for fish or shellfish farming,<br>— any totally or partly submerged appliances or equipment.2. Shall not be placed on the market, or used, as substances or in mixtures where the substance or mixture is intended for use in the treatment of industrial waters, irrespective of their use.3. Shall not be used in the preservation of wood. Furthermore, wood so treated shall not be placed on the market.4. By way of derogation from paragraph 3:<br>a) Relating to the substances and mixtures for the preservation of wood: these may only be used in industrial installations using vacuum or pressure to impregnate wood if they are solutions of inorganic compounds of the copper, chromium, arsenic (CCA) type C and if they are authorised in accordance with Article 5(1) of Directive 98/8/EC. Wood so treated shall not be placed on the market before fixation of the preservative is completed.<br>b) Wood treated with CCA solution in accordance with point (a) may be placed on the market for professional and industrial use provided that the structural integrity of the wood is required for human or livestock safety and skin contact by the general public during its service life is unlikely:<br>— as structural timber in public and agricultural buildings, office buildings, and industrial premises,<br>— in bridges and bridgework,<br>— as constructional timber in freshwater areas and brackish waters, for example jetties and bridges,<br>— as noise barriers,<br>— in avalanche control,<br>— in highway safety fencing and barriers,<br>— as debarked round conifer livestock fence posts,<br>— in earth retaining structures,<br>— as electric power transmission and telecommunications poles,<br>— as underground railway sleepers.<br>c) Without prejudice to the application of other Community provisions on the classification, packaging and labelling of substances and mixtures, suppliers shall ensure before the placing on the market that all treated wood placed on the market is individually labelled "For professional and industrial installation and use only, contains |

| | | |
|---|---|---|
| | | arsenic". In addition, all wood placed on the market in packs shall also bear a label stating "Wear gloves when handling this wood. Wear a dust mask and eye protection when cutting or otherwise crafting this wood. Waste from this wood shall be treated as hazardous by an authorised undertaking".<br>d) Treated wood referred to under point a) shall not be used:<br>— in residential or domestic constructions, whatever the purpose,<br>— in any application where there is a risk of repeated skin contact,<br>— in marine waters,<br>— for agricultural purposes other than for livestock fence posts and structural uses in accordance with point (b),<br>— in any application where the treated wood may come into contact with intermediate or finished products intended for human and/or animal consumption.5. Wood treated with arsenic compounds that was in use in the Community before 30 September 2007, or that was placed on the market in accordance with paragraph 4 may remain in place and continue to be used until it reaches the end of its service life.6. Wood treated with CCA type C that was in use in the Community before 30 September 2007, or that was placed on the market in accordance with paragraph 4:<br>— may be used or reused subject to the conditions pertaining to its use listed under points 4 (b), (c) and (d),<br>— may be placed on the market subject to the conditions pertaining to its use listed under points 4(b), (c) and (d).7. Member States may allow wood treated with other types of CCA solutions that was in use in the Community before 30 September 2007:<br>— to be used or reused subject to the conditions pertaining to its use listed under points 4 (b), (c) and (d),<br>— to be placed on the market subject to the conditions pertaining to its use listed under points 4(b), (c) and (d). |
| · cadmium oxide (non-pyrophoric) | Cadmium and its compounds | For the purpose of this entry, the codes and chapters indicated in square brackets are the codes and chapters of the tariff and statistical nomenclature of Common Customs Tariff as established by Council Regulation (EEC) No 2658/87 (OJ L 256, 7.9.1987, p. 42).1. Shall not be used in mixtures and articles produced from synthetic organic polymers (hereafter referred to as plastic material) such as:<br>— polymers or copolymers of vinyl chloride (PVC) [3904 10] [3904 21]<br>— polyurethane (PUR) [3909 50]<br>— low-density polyethylene (LDPE), with the exception of low-density polyethylene used for the production of coloured masterbatch [3901 10]<br>— cellulose acetate (CA) [3912 11]<br>— cellulose acetate butyrate (CAB) [3912 11]<br>— epoxy resins [3907 30]<br>— melamine-formaldehyde (MF) resins [3909 20]<br>— urea-formaldehyde (UF) resins [3909 10]<br>— unsaturated polyesters (UP) [3907 91]<br>— polyethylene terephthalate (PET) [3907 60]<br>— polybutylene terephthalate (PBT)<br>— transparent/general-purpose polystyrene [3903 11]<br>— acrylonitrile methylmethacrylate (AMMA)<br>— cross-linked polyethylene (VPE)<br>— high-impact polystyrene<br>— polypropylene (PP) [3902 10]<br>— high-density polyethylene (HDPE) [3901 20]<br>— acrylonitrile butadiene styrene (ABS) [3903 30]<br>— poly(methyl methacrylate) (PMMA) [3906 10].<br>Mixtures and articles produced from plastic material shall not be placed on the market if the concentration of cadmium (expressed as Cd metal) is equal to or greater than 0,01 % by weight of the plastic material.<br>By way of derogation, the second subparagraph shall not apply to articles placed on the market before 10 December 2011.<br>The first and second subparagraphs apply without prejudice to Council Directive 94/62/EC (OJ L 365, 31.12.1994, p. 10) and acts adopted on its basis.By 19 November 2012, in accordance with Article 69, the Commission shall ask the European Chemicals Agency to prepare a dossier conforming to the requirements of Annex XV in order to assess whether the use of cadmium and its compounds in plastic material, other than that listed in subparagraph 1, should be restricted.2. Shall not be used or placed on the market in paints with codes [3208] [3209] in a concentration (expressed as Cd metal) equal to or greater than 0,01 % by weight.<br>For paints with codes [3208] [3209] with a zinc content exceeding 10 % by weight of the paint, the concentration of cadmium (expressed as Cd metal) shall not be equal to or greater than 0,1 % by weight.<br>Painted articles shall not be placed on the market if the concentration of cadmium (expressed as Cd metal) is equal to or greater than 0,1 % by weight of the paint on the painted article.3. By way of derogation, paragraphs 1 and 2 shall not apply to articles coloured with mixtures containing cadmium for safety reasons.4. By way of derogation, paragraph 1, second subparagraph shall not apply to:<br>— mixtures produced from PVC waste, hereinafter referred to as "recovered PVC",<br>— mixtures and articles containing recovered PVC if their concentration of cadmium (expressed as Cd metal) does not exceed 0,1 % by weight of the plastic material in the following rigid PVC applications:<br>(a) profiles and rigid sheets for building applications;<br>(b) doors, windows, shutters, walls, blinds, fences, and roof gutters;<br>(c) decks and terraces;<br>(d) cable ducts;<br>(e) pipes for non-drinking water if the recovered PVC is used in the middle layer of a multilayer pipe and is entirely covered with a layer of newly produced PVC in compliance with paragraph 1 above. Suppliers shall ensure, before the placing on the market of mixtures and articles containing recovered PVC for the first time, that these are visibly, |

| | | |
|---|---|---|
| | | legibly and indelibly marked as follows: “Contains recovered PVC” or with the following pictogram:Pictogram recovered PVCIn accordance with Article 69 of this Regulation, the derogation granted in paragraph 4 will be reviewed, in particular with a view to reducing the limit value for cadmium and to reassess the derogation for the applications listed in points (a) to (e), by 31 December 2017.5. For the purpose of this entry, “cadmium plating” means any deposit or coating of metallic cadmium on a metallic surface. Shall not be used for cadmium plating metallic articles or components of the articles used in the following sectors/applications:<br>a) equipment and machinery for:<br>— food production [8210] [8417 20] [8419 81] [8421 11] [8421 22] [8422] [8435] [8437] [8438] [8476 11]<br>— agriculture [8419 31] [8424 81] [8432] [8433] [8434] [8436]<br>— cooling and freezing [8418] — printing and book-binding [8440] [8442] [8443] (b) equipment and machinery for the production of:<br>— household goods [7321] [8421 12] [8450] [8509] [8516]<br>— furniture [8465] [8466] [9401] [9402] [9403] [9404]<br>— sanitary ware [7324]<br>— central heating and air conditioning plant [7322] [8403] [8404] [8415]<br>In any case, whatever their use or intended final purpose, the placing on the market of cadmium-plated articles or components of such articles used in the sectors/applications listed in points (a) and (b) above and of articles manufactured in the sectors listed in point (b) above is prohibited.6. The provisions referred to in paragraph 5 shall also be applicable to cadmium-plated articles or components of such articles when used in the sectors/applications listed in points (a) and (b) below and to articles manufactured in the sectors listed in (b) below:<br>(a) equipment and machinery for the production of:<br>— paper and board [8419 32] [8439] [8441] textiles and clothing [8444] [8445] [8447] [8448] [8449] [8451] [8452]<br>(b) equipment and machinery for the production of:<br>— industrial handling equipment and machinery [8425] [8426] [8427] [8428] [8429] [8430] [8431]<br>— road and agricultural vehicles [chapter 87]<br>— rolling stock [chapter 86]<br>— vessels [chapter 89].7. However, the restrictions in paragraphs 5 and 6 shall not apply to:<br>— articles and components of the articles used in the aeronautical, aerospace, mining, offshore and nuclear sectors whose applications require high safety standards and in safety devices in road and agricultural vehicles, rolling stock and vessels,<br>— electrical contacts in any sector of use, where that is necessary to ensure the reliability required of the apparatus on which they are installed.‘8. Shall not be used in brazing fillers in concentration equal to or greater than 0,01 % by weight. Brazing fillers shall not be placed on the market if the concentration of cadmium (expressed as Cd metal) is equal to or greater than 0,01 % by weight. For the purpose of this paragraph brazing shall mean a joining technique using alloys and undertaken at temperatures above 450 °C.9. By way of derogation, paragraph 8 shall not apply to brazing fillers used in defence and aerospace applications and to brazing fillers used for safety reasons.10. Shall not be used or placed on the market if the concentration is equal to or greater than 0,01 % by weight of the metal in:<br>(i) metal beads and other metal components for jewellery making;<br>(ii) metal parts of jewellery and imitation jewellery articles and hair accessories, including:<br>— bracelets, necklaces and rings,<br>— piercing jewellery,<br>— wrist-watches and wrist-wear,<br>— brooches and cufflinks.11. By way of derogation, paragraph 10 shall not apply to articles placed on the market before 10 December 2011 and jewellery more than 50 years old on 10 December 2011 |
| · cadmium oxide (non-pyrophoric)<br>· iron arsenate | Substances which appear in Part 3 of Annex VI to Regulation (EC) No 1272/2008 classified as carcinogen category 1A or 1B (Table 3.1) or carcinogen category 1 or 2 (Table 3.2) and listed as follows: - Carcinogen category 1A (Table 3.1)/carcinogen category 1 (Table 3.2) listed in Appendix 1 - Carcinogen category 1B (Table 3.1)/carcinogen category 2 (Table 3.2) listed in Appendix 2 | Without prejudice to the other parts of this Annex the following shall apply to entries 28 to 30:1. Shall not be placed on the market, or used,<br>— as substances,<br>— as constituents of other substances, or,<br>— in mixtures,<br>for supply to the general public when the individual concentration in the substance or mixture is equal to or greater than:<br>— either the relevant specific concentration limit specified in Part 3 of Annex VI to Regulation (EC) No 1272/2008, or,<br>— the relevant concentration specified in Directive 1999/45/EC where no specific concentration limit is set out in Part 3 of Annex VI to Regulation (EC) No 1272/2008.<br>Without prejudice to the implementation of other Community provisions relating to the classification, packaging and labelling of substances and mixtures, suppliers shall ensure before the placing on the market that the packaging of such substances and mixtures is marked visibly, legibly and indelibly as follows: “Restricted to professional users”.2. By way of derogation, paragraph 1 shall not apply to:<br>(a) medicinal or veterinary products as defined by Directive 2001/82/EC and Directive 2001/83/EC;<br>(b) cosmetic products as defined by Directive 76/768/EEC;<br>(c) the following fuels and oil products:<br>— motor fuels which are covered by Directive 98/70/EC,<br>— mineral oil products intended for use as fuel in mobile or fixed combustion plants,<br>— fuels sold in closed systems (e.g. liquid gas bottles);<br>(d) artists’ paints covered by Directive 1999/45/EC;<br>(e) the substances listed in Appendix 11, column 1, for the applications or uses listed in Appendix 11, column 2. Where a date is specified in column 2 of Appendix 11, the derogation shall apply until the said date. |
| | | |

| | | |
|---|---|---|
| · lead monoxide | Substances which appear in Part 3 of Annex VI to Regulation (EC) No 1272/2008 classified as toxic to reproduction category 1A or 1B (Table 3.1) or toxic to reproduction category 1 or 2 (Table 3.2) and listed as follows: - Reproductive toxicant category 1A adverse effects on sexual function and fertility or on development (Table 3.1) or reproductive toxicant category 1 with R60 (May impair fertility) or R61 (May cause harm to the unborn child) (Table 3.2) listed in Appendix 5 - Reproductive toxicant category 1B adverse effects on sexual function and fertility or on development (Table 3.1) or reproductive toxicant category 2 with R60 (May impair fertility) or R61 (May cause harm to the unborn child) (Table 3.2) listed in Appendix 6 | Without prejudice to the other parts of this Annex the following shall apply to entries 28 to 30:1. Shall not be placed on the market, or used,<br>— as substances,<br>— as constituents of other substances, or,<br>— in mixtures,<br>for supply to the general public when the individual concentration in the substance or mixture is equal to or greater than:<br>— either the relevant specific concentration limit specified in Part 3 of Annex VI to Regulation (EC) No 1272/2008, or,<br>— the relevant concentration specified in Directive 1999/45/EC where no specific concentration limit is set out in Part 3 of Annex VI to Regulation (EC) No 1272/2008.<br>Without prejudice to the implementation of other Community provisions relating to the classification, packaging and labelling of substances and mixtures, suppliers shall ensure before the placing on the market that the packaging of such substances and mixtures is marked visibly, legibly and indelibly as follows: “Restricted to professional users”.2. By way of derogation, paragraph 1 shall not apply to:<br>(a) medicinal or veterinary products as defined by Directive 2001/82/EC and Directive 2001/83/EC;<br>(b) cosmetic products as defined by Directive 76/768/EEC;<br>(c) the following fuels and oil products:<br>— motor fuels which are covered by Directive 98/70/EC,<br>— mineral oil products intended for use as fuel in mobile or fixed combustion plants,<br>— fuels sold in closed systems (e.g. liquid gas bottles);<br>(d) artists’ paints covered by Directive 1999/45/EC;<br>(e) the substances listed in Appendix 11, column 1, for the applications or uses listed in Appendix 11, column 2. Where a date is specified in column 2 of Appendix 11, the derogation shall apply until the said date. |
| · lead monoxide | Lead and its compounds | 1. Shall not be placed on the market or used in any individual part of jewellery articles if the concentration of lead (expressed as metal) in such a part is equal to or greater than 0,05 % by weight.2. For the purposes of paragraph 1:<br>(i) "jewellery articles" shall include jewellery and imitation jewellery articles and hair accessories, including:<br>(a) bracelets, necklaces and rings;<br>(b) piercing jewellery;<br>(c) wrist watches and wrist-wear;<br>(d) brooches and cufflinks;<br>(ii) "any individual part" shall include the materials from which the jewellery is made, as well as the individual components of the jewellery articles.3. Paragraph 1 shall also apply to individual parts when placed on the market or used for jewellery-making.4. By way of derogation, paragraph 1 shall not apply to:<br>(a) crystal glass as defined in Annex I (categories 1, 2, 3 and 4) to Council Directive 69/493/EEC (*);<br>(b) internal components of watch timepieces inaccessible to consumers;<br>(c) non-synthetic or reconstructed precious and semiprecious stones (CN code 7103, as established by Regulation (EEC) No 2658/87), unless they have been treated with lead or its compounds or mixtures containing these substances;<br>(d) enamels, defined as vitrifiable mixtures resulting from the fusion, vitrification or sintering of minerals melted at a temperature of at least 500 °C. (*) OJ L 326, 29.12.1969, p. 36.5. By way of derogation, paragraph 1 shall not apply to jewellery articles placed on the market for the first time before 9 October 2013 and jewellery articles produced before 10 December 1961.6. By 9 October 2017, the Commission shall re-evaluate paragraphs 1 to 5 of this entry in the light of new scientific information, including the availability of alternatives and the migration of lead from the articles referred to in paragraph 1 and, if appropriate, modify this entry accordingly.7. Shall not be placed on the market or used in articles supplied to the general public, if the concentration of lead (expressed as metal) in those articles or accessible parts thereof is equal to or greater than 0,05 % by weight, and those articles or accessible parts thereof may, during normal or reasonably foreseeable conditions of use, be placed in the mouth by children.<br>That limit shall not apply where it can be demonstrated that the rate of lead release from such an article or any such accessible part of an article, whether coated or uncoated, does not exceed 0,05 µg/cm2 per hour (equivalent to 0,05 µg/g/h), and, for coated articles, that the coating is sufficient to ensure that this release rate is not exceeded for a period of at least two years of normal or reasonably foreseeable conditions of use of the article.<br>For the purposes of this paragraph, it is considered that an article or accessible part of an article may be placed in the mouth by children if it is smaller than 5 cm in one dimension or has a detachable or protruding part of that size.8. By way of derogation, paragraph 7 shall not apply to:<br>(a) jewellery articles covered by paragraph 1;<br>(b) crystal glass as defined in Annex I (categories 1, 2, 3 and 4) to Directive 69/493/EEC;<br>(c) non-synthetic or reconstructed precious and semi-precious stones (CN code 7103 as established by Regulation (EEC) No 2658/87) unless they have been treated with lead or its compounds or mixtures containing these substances;<br>(d) enamels, defined as vitrifiable mixtures resulting from the fusion, vitrification or sintering of mineral melted at a temperature of at least 500 °C;<br>(e) keys and locks, including padlocks;<br>(f) musical instruments;<br>(g) articles and parts of articles comprising brass alloys, if the concentration of lead (expressed as metal) in the brass alloy does not exceed 0,5 % by weight;<br>(h) the tips of writing instruments;<br>(i) religious articles;<br>(j) portable zinc-carbon batteries and button cell batteries;<br>(k) articles within the scope of:<br>(i) Directive 94/62/EC; |

| | | |
|---|---|---|
| | | (ii) Regulation (EC) No 1935/2004;<br>(iii) Directive 2009/48/EC of the European Parliament and of the Council (*);<br>(iv) Directive 2011/65/EU of the European Parliament and of the Council (**)9. By 1 July 2019, the Commission shall re-evaluate paragraphs 7 and 8(e), (f), (i) and (j) of this entry in the light of new scientific information, including the availability of alternatives and the migration of lead from the articles referred to in paragraph 7, including the requirement on coating integrity, and, if appropriate, modify this entry accordingly.10. By way of derogation paragraph 7 shall not apply to articles placed on the market for the first time before 1 June 2016.(*) Directive 2009/48/EC of the European Parliament and of the Council of 18 June 2009 on the safety of toys (OJ L 170, 30.6.2009, p. 1).<br>(**) Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (OJ L 174, 1.7.2011, p. 88). |

**National legislation Belgium**

zinc calcine

No data available

iron arsenate

| | |
|---|---|
| Additional classification | C; La mention “C” signifie que l’agent en question relève du champ d’application de l’arrêté royal du 2 décembre 1993 concernant la protection des travailleurs contre les risques liés à l’exposition à des agents cancérigènes et mutagènes au travail. |

**National legislation The Netherlands**

zinc calcine

| | |
|---|---|
| Waste identification (the Netherlands) | LWCA (the Netherlands): KGA category 05 |
| Waterbezwaarlijkheid | Z (1) |

cadmium oxide (non-pyrophoric)

| | |
|---|---|
| SZW - List of carcinogenic substances | Listed in SZW-list of carcinogenic substances |
| SZW - List of reprotoxic substances (fertility) | Suspected of damaging fertility. |
| SZW - List of reprotoxic substances (development) | Suspected of damaging the unborn child. |
| SZW - List of reprotoxic substances (brest-feeding) | May cause harm to breastfed babies |

lead monoxide

| | |
|---|---|
| SZW - List of reprotoxic substances (fertility) | Suspected of damaging fertility. |
| SZW - List of reprotoxic substances (development) | May damage the unborn child. |

iron arsenate

| | |
|---|---|
| SZW - List of carcinogenic substances | Listed in SZW-list of carcinogenic substances |
| SZW - List of reprotoxic substances (fertility) | May damage fertility. |
| SZW - List of reprotoxic substances (development) | May damage the unborn child. |
| SZW - List of reprotoxic substances (brest-feeding) | May cause harm to breastfed babies |

quartz (SiO2)

| | |
|---|---|
| SZW - List of carcinogenic substances | Listed in SZW-list of carcinogenic substances |

manganese oxide

| | |
|---|---|
| SZW - List of reprotoxic substances (fertility) | Suspected of damaging fertility. |
| SZW - List of reprotoxic substances (development) | Suspected of damaging the unborn child. |

**National legislation France**

zinc calcine

No data available

cadmium oxide (non-pyrophoric)

| | |
|---|---|
| Catégorie cancérogène | C1B |
| Catégorie mutagène | M2 |
| Catégorie toxique pour la reproduction | R2 |

lead monoxide

| | |
|---|---|
| Catégorie cancérogène | (C1A,C1B,C2) |
| Catégorie toxique pour la reproduction | (R1A,R1B,R2) |

diantimony trioxide

| | |
|---|---|
| Catégorie cancérogène | (C1A,C1B,C2) |

**National legislation Germany**

zinc calcine

| | |
|---|---|
| WGK | 3; Classification water polluting based on the components in compliance with Verwaltungsvorschrift wassergefährdender Stoffe (VwVwS) of 27 July 2005 (Anhang 4) |

zinc oxide

| | |
|---|---|
| TA-Luft | 5.2.1 |

copper oxide

| | |
|---|---|
| TA-Luft | 5.2.2; III |

cadmium oxide (non-pyrophoric)

| | |
|---|---|
| TA-Luft | 5.2.7.1.1; I |

lead monoxide

| | |
|---|---|
| TA-Luft | 5.2.2; II |

iron arsenate

| | |
|---|---|
| TA-Luft | 5.2.7.1.1; I |

diantimony trioxide

| | |
|---|---|
| TA-Luft | 5.2.2; III |

quartz (SiO2)

| | |
|---|---|
| TA-Luft | 5.2.1 |

manganese oxide

| | |
|---|---|
| TA-Luft | 5.2.2; III |
| TRGS900 - Risiko der Fruchtschädigung | Y; Risiko der Fruchtschädigung braucht bei Einhaltung des Arbeitsplatzgrenzwertes und des biologischen Grenzwertes nicht befürchtet zu werden |
| | Y; Risiko der Fruchtschädigung braucht bei Einhaltung des Arbeitsplatzgrenzwertes und des biologischen Grenzwertes nicht befürchtet zu werden |

aluminium oxide

| | |
|---|---|
| TA-Luft | 5.2.1 |

calcium oxide

| | |
|---|---|
| TA-Luft | 5.2.1 |
| TRGS900 - Risiko der Fruchtschädigung | Y; Risiko der Fruchtschädigung braucht bei Einhaltung des Arbeitsplatzgrenzwertes und des biologischen Grenzwertes nicht befürchtet zu werden |

magnesium oxide

| | |
|---|---|
| TA-Luft | 5.2.1 |

**National legislation United Kingdom**

zinc calcine

No data available

iron arsenate

| | |
|---|---|
| Carcinogen | Carc |

**Other relevant data**

zinc calcine

No data available

cadmium oxide (non-pyrophoric)

| | |
|---|---|
| TLV - Carcinogen | Cadmium, compounds, as Cd; A2 |
| IARC - classification | 1; Cadmium and cadmium compounds |

lead monoxide

| | |
|---|---|
| TLV - Carcinogen | Lead, inorganic compounds, as Pb; A3 |
| IARC - classification | 2A; Inorganic lead compounds |

iron arsenate

| | |
|---|---|
| TLV - Carcinogen | Arsenic, inorganic compounds (exept Arsine), as As; A1 |

diantimony trioxide

| | |
|---|---|
| TLV - Carcinogen | Antimony trioxide production; A2 |
| IARC - classification | 2B; Antimony trioxide and antimony trisulfide |

quartz (SiO2)

| | |
|---|---|
| TLV - Carcinogen | Silica-Crystalline Quartz; A2 |
| IARC - classification | 1; Silica dust, crystalline, in the form of quartz or cristobalite |

manganese oxide

| | |
|---|---|
| TLV - Carcinogen | Manganese, inorganic compounds, as Mn; A4 |

aluminium oxide

| | |
|---|---|
| TLV - Carcinogen | Aluminium, insoluble compounds; A4 |

magnesium oxide

| | |
|---|---|
| TLV - Carcinogen | Magnesium oxide; A4 |

### 15.2. Chemical safety assessment

No chemical safety assessment is required; registered as an isolated intermediate.

## SECTION 16: Other information

**Full text of any H-statements referred to under headings 2 and 3:**

H301 Toxic if swallowed.
H302 Harmful if swallowed.
H315 Causes skin irritation.
H318 Causes serious eye damage.
H330 Fatal if inhaled.
H331 Toxic if inhaled.
H332 Harmful if inhaled.
H335 May cause respiratory irritation.
H341 Suspected of causing genetic defects.
H350 May cause cancer.
H350i May cause cancer by inhalation.
H351 Suspected of causing cancer if inhaled.
H360Df May damage the unborn child. Suspected of damaging fertility.
H361fd Suspected of damaging fertility. Suspected of damaging the unborn child.
H372 Causes damage to organs through prolonged or repeated exposure if swallowed.
H372 Causes damage to organs through prolonged or repeated exposure if inhaled.
H373 May cause damage to organs through prolonged or repeated exposure.
H373 May cause damage to organs through prolonged or repeated exposure if inhaled.
H373 May cause damage to organs (blood system, central nervous system, lungs, kidneys) through prolonged or repeated exposure if swallowed and if inhaled (major route).
H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.

(*) = INTERNAL CLASSIFICATION BY BIG

PBT-substances = persistent, bioaccumulative and toxic substances

CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

**M-factor**

| | | | |
|---|---|---|---|
| zinc oxide | 1 | Acute | ECHA |
| zinc oxide | 1 | Chronic | ECHA |
| lead monoxide | 1 | Acute | BIG |
| iron arsenate | 1 | Acute | BIG |

**Specific concentration limits CLP**

| | | | |
|---|---|---|---|
| lead monoxide | C ≥ 2,5 % | Repr. 2; H361f | CLP Annex VI (ATP 0) |
| | C ≥ 0,5 % | STOT RE 2; H373 | CLP Annex VI (ATP 0) |

# Annex to the Safety Data Sheet
# Calcine, zinc ore concentrate (EC 273-776-3)

This annex contains information on risk management measures as specified in appendix 3 of the registration dossier for isolated on-site and transported intermediates

## 1. Brief description of technological process applied in manufacture of the intermediate EC 273-776-3

- Stockpiling of the sulphidic-concentrates, and optionally, other primary or secondary zinc-bearing materials in isolated storage zones or silo's.
- Sampling and laboratory analysis
- Blending of the materials before feeding the furnace
- Feeding of the blend by enclosed belts up to the furnace mouth.
- Roasting at elevated temperature: about 950°C according to the feed composition or higher by blowing air enriched or not with $O_2$.
- Air oxidizes the zinc sulphide to solid zinc-oxide and Sulphur Dioxide collected in the gas cleaning system together with some volatile components and entrained particles from the furnace in the gas-cleaning system
- A by-product of the roasting is sulphur dioxide, which is marketed as such (liquid) or further processed into sulphuric acid, a commodity.
- The gas cleaning system aims at collecting dust and impurities before the sulphuric acid plant or $SO_2$ condensation
- Most of zinc in concentrates is oxidized to zinc oxide; depending on iron content at the roasting the remaining zinc is linked to iron forming zinc ferrite at roasting temperature; zinc oxide and zinc ferrites are the main components of the Intermediate EC 273-776-3.
- The main reaction is to transform the polymetallic sulphide into an oxidic complex material (calcine)
- The intermediate (Calcine) is collected automatically from the furnace and allowed to cool down
- If required, it can further be ground before being transferred to storage zones or silo's through specially designed transfer units (i.e. pneumatic transport)
- In case of transport to other premises, the Intermediate will be loaded in containers (barrels, small containers, bulk containers, silo-trucks, bulk transport ships, barges …)
- Waste of the process:
    - Waste-sludge filtered and collected from the wet gas-cleaning system, usually recycled or is eventually inertised and landfilled in regulated/authorised dumpsites
    - Filtered gas-cleaning waters to be treated in the waste-water-treatment-plant

## 2. Brief description of technological processes applied in use of the intermediate EC 273-776-3

- Typically used in the production of zinc salt solutions
- The zinc calcine is transferred to silo's near the Leaching plant, pneumatically, hydraulically or by closed conveyor belts; it can also be unloaded from [pneumatic] transport trucks, trains, containers, ships, barges…and transferred to storage zones or silo's through specially designed transfer units, [reddlers, conveyor belts, ...]
- The zinc calcine is optionally blended with other Zinc-containing oxidic recovered materials
- The mixture is continuously fed to leaching tanks (closed loop of acidic solution, mostly sulphate) used in the production of (Intermediate) Zinc salt solutions (EC 273-723-4)
- Waste treatment: Iron-Leach-residue, calcine leach residue (Jarosite, goethite) are sent to specially designed landfill installations with or without previous treatment (ex: jarofix process)

## 3. Means of rigorous containment and minimisation technologies applied by the registrant during the manufacturing and /or use process

### ⇨ Description of the technical means to rigorously contain the substance

- Furnace is closed, gas cleaning section as well
- Roasting is operated under strong aspiration (negative pressure)
- Process enclosure, especially in potentially dusty units
- All processes are performed in a confined area, all residues containing zinc are recycled
- Containment of liquid volumes in sumps to collect/prevent accidental spillage
- The process is managed and controlled from a separate control-room.

### ⇨ Identification of residual emissions to workplace & environment

Residual exposures at the workplace and the environment are assessed from regular measurements of dust/metals and represent usually a global exposure to several steps in a process. Dust control: dust and Zn in dust needs to be measured in the workplace air (static or individual) according to national regulations.

  - Workplaces: dust, metal concentrations: Pb, Cd
  - Workers: biomonitoring – blood for Cd and Pb, Cd-urine
  - Environment air: stack point source measurement (dust, metal concentrations) -
  - Environment water: typically measured prior to discharge, if emissions to surface waters are relevant
- Some non-process waters can be generated containing zinc (e.g. from cleaning)
- Run-off water from smelter area
- Water from wet-gas cleaning
  - ⇨ The waters are collected and recycled as much as possible. All plants have a special water treatment plant before discharge

### ⇨ Description of the procedural and control technologies to minimise emission and resulting exposure

- Air emissions are controlled by use of cyclones, Electrostatic Precipitators (ESP), scrubbers, catalytic beds, filters, demisters and/or other air emission abatement devices e.g. filters, wet scrubbers. This may create a general negative pressure at the system openings (loading, sampling, production exit).
- occasional (sampling, cleaning, maintenance) and potentially direct exposure for workers
- On-site waste water treatment techniques are applied to prevent releases to water (if applicable) e.g.: chemical precipitation, sedimentation and filtration.
- Local exhaust ventilation systems; specific extraction of process gasses from calcine coolers, and/or ball mill
- Special care for the general establishment and maintenance of a clean working environment by e.g.:
  - Cleaning of process equipment and workshop
  - Storage of calcine/sinter in dedicated silos
- Wearing of gloves, all the pertinent PPE and protective clothing is compulsory
- With normal handling, no respiratory personal protection (breathing apparatus) is necessary.
- Eyes: safety glasses are compulsory, sometimes highly recommended

⇨ **Specification of management means and training that particularly contribute to the functioning of the technical means described above**

- integrated management system is implemented on the workplace e.g. ISO 9000, ISO ICS13100 series, ISO 1400X series, EMAS, or alike and, as usually applicable, by being IPPC/IED-compliant (cf. NFM-BREF)
- housekeeping and hygiene procedures in place
- training provided for internal and external cleaning teams or technicians
- Follow up HS by medical unit: biomonitoring required (i.e. Pb, Cd...)

## 4. Means of rigorous containment and minimisation technologies recommended to the user of the intermediate

- Means of containment and minimisation technologies are same as above
- The zinc calcine is unloaded from [pneumatic] transport trucks, train, ADR-big-bags or containers, bulk transport ships…and transferred to storage zones or silo's through especially designed transfer units
- Material composition, handling, storage procedures and general guidance on safe use are communicated to the personnel or downstream (external) user by means of Safety Data Sheet

## 5. Special procedures applied before cleaning and maintenance

- Procedures are in place to ensure safe cleaning and maintenance operations
    - Stopping (part of) the process
    - Cooling down and proper ventilation of equipment
    - Switch off power supply & lock out procedure
    - Some operations can be done without stopping the process (waste steam boiler)
    - Special PPE mandatory for cleaning personnel or maintenance technicians
    - Planning and training for internal and external personnel
- general guidance on safe use is communicated to the personnel or downstream (external) user by means of Safety Data Sheet
- the regular cleaning of the waste steam boiler is done without stopping the process, see section 6

## 6. Describe activity and type of PPE in case of accidents, incidents, maintenance and cleaning activities

Accidental release measures:

- **Workers**: In the event of dust rising, avoid inhalation by putting on suitable, approved breathing apparatus (filter class P3). Remove unprotected staff from the hazardous area. Put on protective equipment. Leave emission area.
- **Environment**: Avoid dust, e.g. by moistening. Prevention of entry into the public sewers, surface or ground water.
- **Cleaning**: Take up material as far as possible in the dry state, e.g. with industrial vacuum cleaners with suitable waste-air filters (dust class 'H' acc. to DIN EN 60335-2-69 App. AA and to E DIN IEC 61 J/94/CD) or use central vacuuming units with waste air filtering equipment. Collect for use in accordance with the intended purpose or return to the producer for treatment. Fill and or pump any possible sludge into appropriate containers. Dispose of any contaminated material as waste according to the disposal procedure.

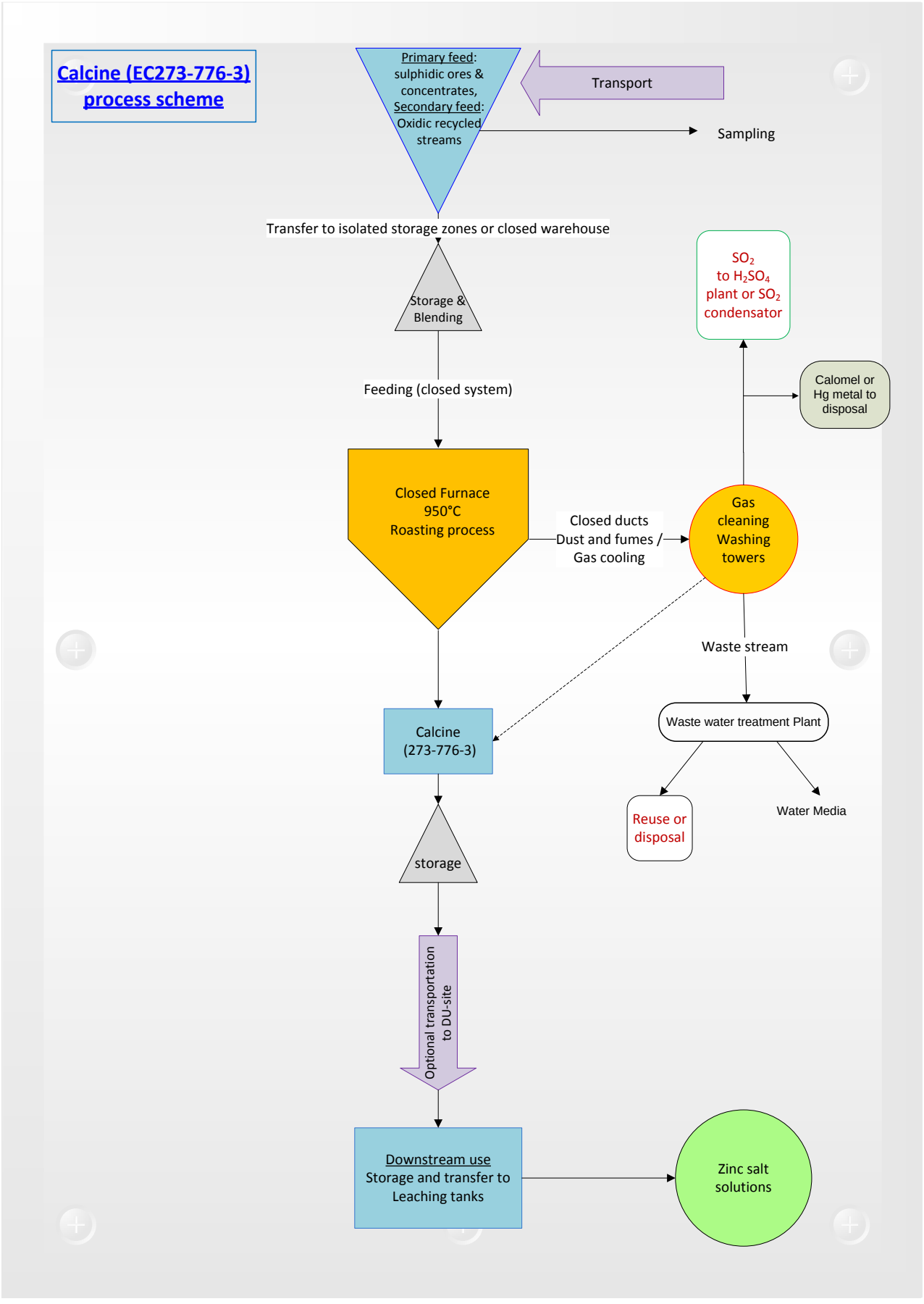
and Fire: Wear approved self-contained breathing apparatus, collect contaminated extinguishing water separately; it must not enter the public sewers.
Periodic maintenance: (Furnace and associated equipment if applicable, Off-gas treatment system, Repair operations, Observational tasks and control activities), the following measures are taken:

- General protective hygiene measures: Keep away from food, beverages and animal feed. At work do not eat, drink, smoke or take snuff. Remove soiled, soaked clothing. After work and before breaks ensure thorough skin cleansing. Separate storing of protective / work clothing is necessary.
- Respiratory protection: Use only approved respirators. Use respiratory protection masks with P3 filter (DIN EN 143). With a longer period of exposure the use of self-contained respirators is recommended. In the event of the release of smoke or vapours: use combined filters against inorganic vapours (e.g. B1-P2 (DIN EN 141)).
- Hand protection: Gloves providing protection from chemicals according to EN 374 of acrylonitrile or polyvinyl chloride (PVC)
- Eye protection: Safety glasses. Tight-closing safety goggles (DIN EN 166), if necessary
- Body protection: Usual chemical work clothing.

Cleaning activity: (Process equipment, Workshop), the same applies.

## 7. Waste information

- The intermediate is a product for the production of zinc as a metal. If the normal processing route cannot be adhered to, returning it to the producer is recommended otherwise disposal should be in accordance with the official regulations
- PPE equipment is collected and disposed of
- Packaging?
- Calomel either recycled or landfilled according to legislation
- Hg considered as waste and land filled according to legislation


Calcine (EC273-776-3) process scheme
Primary feed: sulphidic ores & concentrates, Secondary feed: Oxidic recycled streams
Transport
Sampling
Transfer to isolated storage zones or closed warehouse
Storage & Blending
Feeding (closed system)
Closed Furnace 950°C Roasting process
Closed ducts Dust and fumes / Gas cooling
Gas cleaning Washing towers
SO2 to H2SO4 plant or SO2 condensator
Calomel or Hg metal to disposal
Waste stream
Waste water treatment Plant
Reuse or disposal
Water Media
Calcine (273-776-3)
storage
Optional transportation to DU-site
Downstream use Storage and transfer to Leaching tanks
Zinc salt solutions