1. IDENTIFICATION OF SUBSTANCE AND OF THE COMPANY

Trade name / Substance Name: ZINC PHOSPHATE PZ20/PZW2
  (IUPAC: trizinc bis(orthophosphate))

REACH Registration number: 01-2119485044-40-0001

Type of use: anticorrosive pigment for: paints and inks (solid corrosive inhibitor), plants nutrient (fertilizer) (see section 16 and e-SDS).

Manufacturer: SOCIETE NOUVELLE DES COULEURS ZINCIQUES

Plant
BP 59
59111 Bouchain
FRANCE

Sales department
45/49 Chaussée Jules César
95250 Beauchamp
FRANCE

Tel: INT + 33.1.30.40.57.57
Fax: INT + 33.1.39.60.78.34
E.mail: sncz@sncz.net
MSDS contact: msds@sncz.net

Europe emergency contact: INT + 33 1 30 40 57 57 (France).
24-hour emergency number (USA): 800 424 9300 (CHEMTREC - USA).
24-hour international emergency number: INT + 1 703 527 3887 (CHEMTREC - USA).

2. HAZARD IDENTIFICATION

2.1 Classification according to Regulation 1272/2008/EC [CLP/GHS]

Hazard pictogram:

Signal word: WARNING

Hazard statements: H410 Very toxic to aquatic life with long lasting effects

Precautionary statements:
Prevention: P273 Avoid release to the environment
Response: P391 Collect spillage
Disposal: P501 Dispose of contents/ containers to be collected by a licensed contractor in accordance with national and local regulations.

Environmental Risks: The zinc phosphate substance is classified as very toxic to aquatic life Acute Category 1 and Chronic Category: Very toxic to aquatic life with long lasting effects.
2. HAZARD IDENTIFICATION (continued)

2.2 Classification according to Directive 67/548/EEC and 1999/45/EC
(Applicable up to 12/2010 for substances and 06/2015 for preparations):

**Danger:**

Dangerous for the environment.

Environmental Risk: this substance is very toxic to aquatic organisms. It is highly recommended not to allow this product to enter the environment. This product may cause long-term adverse effects in the environment.

3. COMPOSITION/DATA ON COMPONENTS

**Chemical composition:** ▼ Mono constituent substance, Trizinc bis(orthophosphate) hydrate

\[ \text{Zn}_3(\text{PO}_4)_2 \cdot x \text{H}_2\text{O}, \quad 2 \leq x \leq 4 \] (tetrahydrated = PZ20, dihydrated = PZW2)

**Pigment:** White 32 - **Colour Index:** 77964

REACH Registration number: 01-2119485044-40-0001

**Hazardous components or impurities:** (1) regulation 1272/2008/EC (2) directive 67/548/EEC

<table>
<thead>
<tr>
<th>CAS N°</th>
<th>Annex VI Index N°</th>
<th>EINECS N°</th>
<th>Name</th>
<th>%</th>
<th>Symbol</th>
<th>Phrases</th>
</tr>
</thead>
<tbody>
<tr>
<td>7779-90-0</td>
<td>030-011-00-6</td>
<td>231-944-3</td>
<td>\text{Zn}_3(\text{PO}_4)_2 \cdot x \text{H}_2\text{O}</td>
<td>&gt;97</td>
<td>□ GHS09 (1) N (2)</td>
<td>H400 H410 R50/53</td>
</tr>
</tbody>
</table>

| Impurity | 1314-13-2 | 030-013-00-7 | 215-222-5 | ZnO | [0-3] | GHS09 (1) N (2) | H400 H410 R50/53 |

4. FIRST AID AND MEASURES

**Description of first aid measures:** Get immediately medical attention.

**Specific measure:** no specific requirements.

**After inhaling:** remove from exposure area to fresh air. Seek medical attention.

**After skin contact:** wash with mild soap and water until no evidence of substance remains.

**After eyes contact:** immediately flush eyes with water for at least 15 min, until no evidence of chemical remains. Seek medical attention if necessary.

**After ingestion:** Rinse mouth with water. Immediately get medical attention. Treat symptomatically and supportively. This substance may induce intestinal troubles.

**Most important symptoms and effects, both acute and delayed:** No further relevant information available.

**Indication of any immediate medical attention and special treatment needed:** No further relevant information available.
5. FIRE FIGHTING MEASURES

✓ Suitable extinguishing media: no restriction for neighboring fire.

✓ Special hazards arising from the substance or mixture: not flammable substance, this substance is very toxic to aquatic organisms, may cause long term adverse effects in the aquatic environment. Do not let this substance and its solutions contaminate the environment.

Advice for firefighters

Special personal protection equipment: wear an appropriate protective equipment and an appropriate air respirator.

☐ Conduct of fire fighting: no specific requirement (not flammable fire retardant). Avoid creating dust under nuisance dust permitted limits. In case of fire, do not spill zinc phosphate, residues may contaminate the environment and have to be collected and stocked in special containers. Contaminated wastes have to be collected by a licensed contractor. Dike and contain fire-control water for later disposal. Do not let contaminated water contaminate the environment.

Additional information: contaminated residues/wastes must be collected by a licensed contractor for treatment or disposal.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: If dusting (upper permitted limits), dust mask with a high-efficiency particulate filter (FFP2 minimum) and with a full face-piece.

Environmental precautions: Do not sweep or wash in public stretches of water or unknown discharge, in respect with local regulations. To prevent dispersion on the floor and later in the environment, it is highly recommended to forbid walking on the product spillage. Do not discharge contaminated water in public sewage.

Methods and material for containment and cleaning up

Spill and leak procedure: Avoid/minimise residues and waste production according to local regulations. Use wet clean up technique to avoid dusting. Keep covered material in watertight and closed containers. Suck up avoiding dust (vacuum or wet device). Eliminate residues according to local regulations (dangerous waste).

☐ Soil: Remove containers from spill area. In large spills, rescue must be in the same direction as the wind and prohibit the formation of dust clouds. Collect spills on the floor, eliminate waste according with national regulations.

☐ Water: Not contaminate the environment. Seal the manhole sewer, prohibit access to water contaminated with this product in water systems and contain the water in area water resistant to removal by an authorized company.

7. HANDLING AND STORAGE

☐ Precautions for safe handling:

EC: Handling: Avoid dust breathing and walking in the fallout of the product on the ground. Keep away from food stuff. Use adequate exhaust ventilation to maintain nuisance dust below permitted limits. Do not discharge contaminated water in public sewage.

Protection against fire and explosion: the product is non-flammable.
7. HANDLING AND STORAGE (continued)

- **Conditions for safe storage, including any incompatibilities:**
  
  **Storage conditions:** store under clean, dry conditions at room temperature. Keep containers tightly sealed.

  **Material/Chemical incompatibility:** none. However, it is recommended to store this substance away from acids and ammonia (solubility in these solvents). Storage class (VCI, Germany): 13. Seveso II Directive applies if a total sum of 200 tons environmentally dangerous substances and preparations in production and storage is exceeded.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

- **PROFESSIONAL EXPOSURE CONTROL**

  **EXPOSURE LIMIT VALUE** (Occupational Exposure Limits):

  **Engineering controls:** no specific exposure limits established for substance (OSHA, ACGIH, NIOSH). Cf §7.

- **Parameters of exposure controls:** Total dust

<table>
<thead>
<tr>
<th>Designation</th>
<th>Type of Data</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total dust</td>
<td>TLV: TWA (USA)</td>
<td>10 mg/m³</td>
</tr>
<tr>
<td></td>
<td>MAK (Germany)</td>
<td>6 mg/m³</td>
</tr>
<tr>
<td></td>
<td>VME France 8H</td>
<td>10 mg/m³</td>
</tr>
<tr>
<td></td>
<td>VME France 8H (respirable)</td>
<td>5 mg/m³</td>
</tr>
</tbody>
</table>

- **Parameters of exposure controls:** ZnO – group: slightly soluble Zn compounds

  (as ZnO – Zn(OH)₂ – Zn₃(PO₄)₂ – ZnCO₃ – Zn metal - ZnS)

<table>
<thead>
<tr>
<th>Designation</th>
<th>Type of Data</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZnO</td>
<td>ACGIH-91/93 USA</td>
<td>10 mg/m³</td>
</tr>
<tr>
<td></td>
<td>OSHA (1989)(legal limit values)</td>
<td>5 mg/m³</td>
</tr>
<tr>
<td></td>
<td>DFG (1997) (Germany)</td>
<td>6 mg/m³</td>
</tr>
<tr>
<td></td>
<td>Arbejdstilsynet (1992) Denmark</td>
<td>10 mg/m³</td>
</tr>
<tr>
<td></td>
<td>VME France</td>
<td>10 mg/m³</td>
</tr>
<tr>
<td></td>
<td>SZW (1997) Netherland</td>
<td>5 mg/m³</td>
</tr>
<tr>
<td></td>
<td>HSE (1998) UK</td>
<td>10 mg/m³</td>
</tr>
<tr>
<td></td>
<td>NBOSHS (1993) Suede</td>
<td>5 mg/m³</td>
</tr>
</tbody>
</table>

- **OCCUPATIONAL EXPOSURE MANAGEMENT:**

  - Zn Risk management minimizing, needs an 8 hours time weighted average exposure below the DNEL in occupational workplaces. In order to perform a real exposure on workplace, it is recommended to:
    - Keep under control Zn nuisance dust exposure,
    - Determine the accurate working time per shift,
    - Choose appropriate Personal protective equipment (Respiratory Protective device…) with accurate safety factor.

  - After calculation, Risk Characterisation Ratio (RCR) must be below than 1 for safe operating conditions. For more information see extended safety data sheet.

  - The DNELs for inhalation derived under REACH for both groups are: (Inhalable fraction – Workers)
    - DNEL inhal soluble Zn (worker) = 1 mg Zn/m³;
    - DNEL inhal insoluble Zn (worker) = 5 mg Zn/m³;

  FORM.OSHE/QUALITE 330 v0.04
8. EXPOSURE CONTROLS/PERSONAL PROTECTION (continued)

PERSONAL PROTECTIVE EQUIPMENT

The GES for trizinc bis(orthophosphate) production mentions the following in this respect:
- Wearing of gloves and protective clothing is compulsory (efficiency ≥90%).
- With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:
  - dust filter-half mask P1 (efficiency 75%)
  - dust filter-half mask P2 (efficiency 90%)
  - dust filter-half mask P3 (efficiency 95%)
  - dust filter-full mask P1 (efficiency 75%)
  - dust filter-full mask P2 (efficiency 90%)
  - dust filter-full mask P3 (efficiency 97.5%)
- Eyes: safety glasses are optional
- Information-training of the workers and their staff and line managers focused on careful hygiene behaviour.

Respiratory protection: adapted dust mask while handling the powder (for example FFP2). If possible, use a full face piece mask (upper permitted limits) when dust occurs.

Hand protection: use gloves during handling.

Eye protection: safety goggles with side shields (for example EN166).

Skin protection: Wear appropriate clothing to avoid any contact with skin.

Clothing: Employee must wear appropriate protective (impervious) clothing and equipment to prevent from any possibility of skin contact with this substance,

Other protective equipment/recommendations: observe good personal hygiene. Keep away from food stuff, drinks on the site. Wear appropriate working clothing.

ENVIRONMENT PROTECTIVE MEASURES

Avoid any dust generation. No data are available as to the Environment exposure. However, emissions have to conform to the authorised limits.

The GES for trizinc bis(orthophosphate) production mentions the following in this respect:
- Local exhaust ventilation systems (generic LEC (84%) as worst case; higher efficiencies (90-95%) are usual,
- Cyclones/filters (for minimizing dust emissions) : efficiency: 70-90% (cyclones), 50-80% (dust filters), 85-95% (double stage, cassette filters),
- Process enclosure, especially in potentially dusty units,
- Dust control: dust and Zn in dust needs to be measured in the workplace air (static or individual) according to national regulations,
- Special care for the general establishment and maintenance of a clean working environment by e.g :
  - Cleaning of process equipment and workshop,
  - Storage of packaged Zn product in dedicated zones.

It is impervious to keep under control the zinc phosphate emissions in the environment. If necessary an appropriate treatment device must be installed according to regulations.

Atmospheric emissions: ventilation systems must be appropriate for the level of performance required to control air emissions in accordance with current national requirements.
8. EXPOSURE CONTROLS/PERSONAL PROTECTION (continued)

**Water emissions:** must be controlled to prevent contamination of public sewage, rivers, surface water according national and local regulations.

**Soil emissions:** Do not let this material to contaminate soils or ground.

<table>
<thead>
<tr>
<th>Environmental compartment</th>
<th>PNEC value for Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater</td>
<td>20.6* µg/L</td>
</tr>
<tr>
<td>Saltwater</td>
<td>6.1* µg/L</td>
</tr>
<tr>
<td>Freshwater sediment</td>
<td>235.6 mg/kg sediment dry weight**.</td>
</tr>
<tr>
<td>Saltwater sediment</td>
<td>113 mg/kg sediment dry weight**</td>
</tr>
<tr>
<td>Soil</td>
<td>106.8 mg/kg soil dry weight***.</td>
</tr>
<tr>
<td>STP</td>
<td>52 µg/L</td>
</tr>
</tbody>
</table>

*added value, « PNEC_add »

**A generic bioavailability factor of 0.5 is applied by default, according to the EU risk assessment (ECB 2008)

**A generic bioavailability/ageing factor of 3 is applied by default (ECB 2008).**

9. PHYSICAL AND CHEMICAL PROPERTIES

**Information on basic physical and chemical properties:**

**Physical state** : solid, fine powder  
**Appearance** : white powder  
**Odour** : odourless

**Change in physical state**

<table>
<thead>
<tr>
<th>Dehydration</th>
<th>Melting</th>
<th>Decomposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 - 600°C for tetrahydrated zinc phosphate</td>
<td>900°C</td>
<td>none as long as properly used.</td>
</tr>
<tr>
<td>120 - 600°C for trihydrated zinc phosphate</td>
<td>900°C</td>
<td>none as long as properly used.</td>
</tr>
<tr>
<td>160 - 600°C for dihydrated zinc phosphate</td>
<td>900°C</td>
<td>none as long as properly used.</td>
</tr>
</tbody>
</table>

**Flash point** : not applicable.  
**Flammable properties** : not combustible, fire retardant.  
**Explosion risk** : not applicable.  
**Vapour pressure (20°C)** : not applicable.  
**Specif gravity** : 3.3 – 3.4 g/cm³  ISO 787/10  
**Solubility (water 20°C)** : 0.03 g/l.  ISO 787/10  
**pH (20°C)** : 6 - 8  ISO 787/9  
**Others informations** : none  
**Partition coefficient: n-octanol-water** : not applicable
10. STABILITY AND REACTIVITY

- **Reactivity:** unreactive with respect to materials commonly used in transport, handling and storage of industrial materials

- **Chemical stability:** stable at room temperature and at temperatures up to 70°C (dehydration)

- **Possibility of hazardous reactions:** None hazardous reactions if stored and handled in accordance

- **Conditions to avoid:** Keep clear of acids and bases (solubility in these media)

- **Incompatible materials:** No further relevant information available

**Hazardous decomposition products:** no hazardous decomposition product in normal storage conditions.

11. TOXICOLOGICAL PROPERTIES

**Toxicity**

- **LD 50 mouse intraperitoneal:** 522 mg/kg.
- **LD 50 oral (rat):** > 5,000 mg/kg.
- **LC50 Inhalation Dusts and mists:** >5.7 mg/L 4H (Klimisch and all 1982) based on cross-reading from zinc oxide

**Additional information:** With LD50 values consistently exceeding 2,000 mg/kg bw, slightly soluble compounds such as, trizinc bis(orthophosphate) (LD50 is > 5,000) show low level of acute oral toxicity, not leading to classification for acute oral toxicity. Trizinc bis(orthophosphate) (based on cross-reading from zinc oxide) is of low acute inhalation toxicity (i.e., LC50 values of > 5.7 mg/L/4hrs), not leading to classification for acute inhalation toxicity.

**Primary irritant effect:**

- **Skin:** not irritant (based on cross-reading from ZnO: Löser, 1977; Lansdown, 1991)
- **Eyes:** not irritant (Mirbeau et al, 1999)
- **Respiratory tract:** not irritant (based on cross-reading from ZnO: Klimisch et al, 1982)

**Sensitization:** No sensitizing effects known (based on cross-reading from ZnO: Van Huygevoort, 1999 g,h)

**Repeated dose toxicity:**

- **Specific target organ toxicity (single exposure):** No experimental or epidemiological sufficient evidence for specific target organ toxicity (single exposure) (based on cross-reading from ZnO); no classification for target organ toxicity (single exposure: STOT-SE required) (Heydon and Kagan, 1990; Gordon et al., 1992; Mueller and Seger, 1985 [Cited in Chemical Safety report (CSR) Trizinc bis(orthophosphate). 2010]).

- **Specific target organ toxicity (repeated exposure):** No experimental or epidemiological sufficient evidence for specific target organ toxicity (repeated exposure) (based on cross-reading from ZnO); no classification for specific target organ toxicity (repeated exposure: STOT-RE required) (Lam et al, 1985, 1988; Conner et al.,1988 [Cited in Chemical Safety report (CSR) Trizinc bis(orthophosphate). 2010]).

- **Aspiration hazard:** Not available
11. TOXICOLOGICAL PROPERTIES (continued)

- **Carcinogenicity, Germ cell mutagenicity, Reproductive toxicity (CMR):** No further experimental or epidemiological evidence available
  - **Carcinogenicity**
    No experimental or epidemiological evidence exists to justify classification of zinc compounds for carcinogenic activity (based on cross-reading between Zn compounds); no classification for carcinogenicity required (Chemical Safety report (CSR) Trizinc bis(orthophosphate). 2010)
  - **Germ cell mutagenicity**
    No biologically relevant genotoxic activity (based on cross-reading between Zn compounds); no classification for mutagenicity required (Chemical Safety report (CSR) Trizinc bis(orthophosphate). 2010).
  - **Reproductive toxicity**
    No experimental or epidemiological evidence exists to justify classification of zinc compounds for reproductive or developmental toxicity (based on cross-reading between Zn compounds); no classification for reproductive toxicity required (Chemical Safety report (CSR) Trizinc bis(orthophosphate). 2010).

This product is not hazardous for the human being when used properly.

12. ECOLOGICAL INFORMATION

- **Acute aquatic toxicity**
  The Acute aquatic toxicity database on zinc contains data on 11 standard species obtained under standard testing conditions at different pH and hardness. The full analysis of these data is given in the CSR.

  The reference values for acute aquatic toxicity, based on the lowest observed EC\textsubscript{50} values of the corresponding databases at different pH and expressed as Zn\textsuperscript{2+} ion concentration are:

<table>
<thead>
<tr>
<th>Species</th>
<th>Concentration (mg Zn\textsuperscript{2+}/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity for fish (Oncorhynchus mykiss) as zinc</td>
<td>LC\textsubscript{50} (96 h) 0.14 – 2.6 mg Zn\textsuperscript{2+}/L.</td>
</tr>
<tr>
<td>Acute toxicity for crustacea (Ceriodaphnia dubia) as zinc</td>
<td>EC\textsubscript{50} (48 h) 0.413 mg Zn\textsuperscript{2+}/L. for pH &lt;7</td>
</tr>
<tr>
<td>Acute toxicity for algae (Selenastrum capricornutum) as zinc</td>
<td>EC\textsubscript{50} (72 h) 0.136 – 0.150 mg Zn\textsuperscript{2+}/L.</td>
</tr>
</tbody>
</table>

  After applying the molecular weight correction (transformation/dissolution testing is not relevant since this zinc compound is considered rather soluble), the specific reference values for acute aquatic toxicity of zinc orthophosphate is (applying a PZ20 Zn_3(PO_4)_2,4H_2O/Zn molecular weight ratio of 2.33 and a PZW2 Zn_3(PO_4)_2,2H_2O/Zn molecular weight ratio of 2.15):

<table>
<thead>
<tr>
<th>Species</th>
<th>Concentration (mg Zn\textsuperscript{2+}/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity for fish (Oncorhynchus mykiss) as PZ20</td>
<td>LC\textsubscript{50} (96 h) 0.33 – 6.06 mg PZ20/L.</td>
</tr>
<tr>
<td>Acute toxicity for crustacea (Ceriodaphnia dubia) as PZ20</td>
<td>EC\textsubscript{50} (48 h) 0.96 mg PZ20/L. for pH &lt;7</td>
</tr>
<tr>
<td>Acute toxicity for algae (Selenastrum capricornutum) as PZ20</td>
<td>EC\textsubscript{50} (72 h) 0.32 mg PZ20/L.</td>
</tr>
<tr>
<td>Acute toxicity for fish (Oncorhynchus mykiss) as PZW2</td>
<td>LC\textsubscript{50} (96 h) 0.30 – 5.59 mg PZW2/L.</td>
</tr>
<tr>
<td>Acute toxicity for crustacea (Ceriodaphnia dubia) as PZW2</td>
<td>EC\textsubscript{50} (48 h) 0.89 mg PZW2/L. for pH &lt;7</td>
</tr>
<tr>
<td>Acute toxicity for algae (Selenastrum capricornutum) as PZW2</td>
<td>EC\textsubscript{50} (72 h) 0.29 mg PZW2/L.</td>
</tr>
</tbody>
</table>

  (Pseudokircherniella subcapitata) test according to OECD 201 standard protocol; reference: Van Ginneken, 1994)

  M Factor for this substance is 1 for an equivalent LC\textsubscript{50} [0.1-1.0]mg/l (GHS or 1272/2008/EC regulation).
12. ECOLOGICAL INFORMATION (continued)

- **Chronic aquatic toxicity:**
  - **Freshwater:** The chronic aquatic toxicity database on zinc contains high quality chronic NOEC/EC$_{10}$ values on 23 species (8 taxonomic groups) obtained under a variety of conditions. These data, outlined in the CSR, were compiled in a species sensitivity distribution, from which the PNEC was derived (expressed as Zn$^{2+}$ ion concentration). This PNEC is an added value, i.e. it is to be added to the zinc background in water, see table below.
  - **Marine water:** The chronic aquatic toxicity database on zinc contains high quality chronic NOEC/EC$_{10}$ values on 39 species (9 taxonomic groups) obtained under a variety of conditions. These data, outlined in the CSR, were compiled in a species sensitivity distribution, from which the PNEC was derived (expressed as Zn$^{2+}$ ion concentration). This PNEC is an added value, to be added on the zinc background in water, see table below.

- **Sediment toxicity:** The chronic toxicity of zinc to sediment organisms in the freshwater was assessed based on a database containing high quality chronic NOEC/EC$_{10}$ values on 7 benthic species obtained under a variety of conditions. These data, outlined in the CSR, were compiled in a species sensitivity distribution, from which the PNEC was derived (expressed as total Zn contained in the sediment). This PNEC is an added value, to be added on the zinc background in the sediment, see table below. For the marine sediments, a PNEC was derived using the equilibrium partitioning approach, see table below.

- **Soil toxicity:** The chronic toxicity of zinc to soil organisms was assessed based on a database containing high quality chronic NOEC/EC$_{10}$ values on 18 plant species, 8 invertebrate species and 17 microbial processes, obtained under a variety of conditions. These data, outlined in the CSR, were compiled in a species sensitivity distribution, from which the PNEC was derived (expressed as total Zn contained in the soil). This PNEC is an added value, to be added on the zinc background in the soil, see table below.

- **Toxicity to micro-organisms in STP:** The PNEC for STP was derived by applying an assessment factor to the lowest relevant toxicity value: 5.2mg Zn/l (Dutka et al., 1983)

- **Persistency and biodegradability:** Zinc is an element, and as such the criterion “persistency” is not relevant for the metal and its inorganic compounds in a way as it is applied to organic substances. An analysis on the removal of zinc from the water column has been presented as a surrogate for persistency. The rapid removal of zinc from the water column is documented in the CSR. So, zinc and zinc compounds do not meet this criterion, neither.

- **Behaviour in the environmental compartments**
  - **Bioaccumulative potential:** Zinc is a natural, essential element, which is needed for the optimal growth and development of all living organisms, including man. All living organisms have homeostasis mechanisms that actively regulate zinc uptake and absorption/excretion from the body; due to this regulation, zinc and zinc compounds do not bioaccumulate or biomagnify.
  - **Mobility in soils:** For zinc (like for other metals) the transport and distribution over the different environmental compartments e.g. the water (dissolved fraction, fraction bound to suspended matter), soil (fraction bound or complexed to the soil particles, fraction in the soil pore water,...) is described and quantified by the metal partition coefficients between these different fractions. In the CSR, a solids-water partitioning coefficient of 158.5 l/kg (log value 2.2) was applied for zinc in soils (CSR zinc 2010).

- **Results of PBT and vPvB assessment:** Zinc and zinc compounds are not PBT or vPvB.

- **Others lasting effects:** No further relevant information available
13. DISPOSAL

Methods of waste treatment:

Material: Reduce as possible the amount of waste containing zinc phosphate. It is possible that contaminated waste may meet with the criteria of hazardous waste. Dispose in accordance with local environmental regulations.

* This substance does not meet the definition of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA).

Contaminated package and containers: Empty bags can be either destroyed, or recycled according to the international norms that apply. Spoiled and unclean packaging is regulated by the ADR/IMDG.

14. TRANSPORT INFORMATION

ADR: UN 3077, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (ZINC PHOSPHATE), 9, III, (E)

IMDG: UN 3077, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (ZINC PHOSPHATE), 9, III,

MARINE POLLUTANT

FS: F-A, S-F

IATA: UN 3077, Environmentally hazardous substance, solid, n.o.s. (zinc phosphate), 9, III

Packing instruction: Y956 only for Limited Quantities and gross weight < 30 kg, or 956.

15. REGULATORY INFORMATION

15.1 Labelling according 1272/2008/EC (CLP –GHS):

Hazard pictogram:

WARNING

EINECS: 231-944-3 CAS N°: 7779-90-0 Annex VI Index N°: 030-011-00-6

Hazard statements:

H410 Very toxic to aquatic life with long lasting effects.

Prevention: P273 Avoid release to the environment.

Response: P391 Collect spillage

Disposal: P501 Dispose of contents/ containers to be collected by a licensed contractor in accordance with national and local regulations.
15. REGULATORY INFORMATION (continued)

15.2 Labelling according 67/548/EEC:
This substance is subjected to labelling in accordance with the 67/548/EEC and 1999/45/EC directives. This substance is quoted in the corrigendum to 2004/73/EC of 29 April 2004 adapting to technical progress for the 29th time Council Directive 67/548/EEC.

**Symbol of danger:**

- Dangerous for the environment.

**GHS phrases:**

- **R50/53:** Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- **S60:** This material and its containers must be disposed of as hazardous waste.
- **S61:** Avoid release to the environment. Refer to special instructions / safety data sheets.

16. FURTHER INFORMATION

- **TOTAL LEAD:** < 0.1 %
- **SOLUBLE LEAD (HCl 0.07 N):** < 0.1 %

**UE:** Zinc Phosphate storage is likely to be regulated by the SEVESO II directive; it would be considered as a dangerous substance for the aquatic environment.

**Important phrases (according 1272/2008/UE):**

- **H400:** Very toxic to aquatic life
- **H410:** Very toxic to aquatic life with long lasting effects.
- **R50/53:** Very toxic to aquatic organisms may cause long-term adverse effects in the aquatic environment.

**EUROPEAN LABELLING:**

**Labelling inherent in the use of this compound in a preparation (directive 1999/45/EC):**

The preparation is labelled:

- « N/Dangerous for the environment », R50/53 if the concentration of this substance exceeds 25% on a weight basis;
- « N/Dangerous for the environment », R51/53 if the concentration of this substance is between 2.5 and 25% on a weight basis;
- R52/53 if the concentration of this substance is between 0.25 and 2.5% on a weight basis.

**Labelling inherent in the use of this compound in mixture (regulation CLP/ GHS 1272/2010/EC):**

**Classification of Zinc Phosphate substance:** Acute and chronic aquatic very toxic Category 1. M factor = 1

The mixture containing this product is classified in different categories according the following the calculation concentration rules:

- **Labelling category 1:**

  **GHS Label 09 + Warning**

  **Hazard:** H410 Precautionary: P273 + P391 + P501

  when the concentration of zinc phosphate will exceed 25% in formulation (excluding any addition of other aquatic hazardous material) or according the formula:

  \[ \Sigma (M \times \text{Concentration Chronic Category 1}) \geq 25\% \]
16. FURTHER INFORMATION (continued)

- **Labelling category 2:**

  - **Hazard:** H411 **Precautionary:** P273 + P391 + P501
  - when the concentration of zinc phosphate will be include in the range between 2.5% ≤ x < 25% (excluding any addition of other aquatic hazardous material) or according the formula:
    \[
    \Sigma (M \times 10 \times \text{Concentration Chronic Category 1}) + \Sigma \text{Concentration Chronic Category 2} \geq 25\%
    \]

- **Labelling category 3:**

  - **Hazard:** H412 **Precautionary:** P273 + P501
  - when the concentration of zinc phosphate will be include in the range between 0.25% ≤ x < 2.5% (excluding any addition of other aquatic hazardous material) or according the formula:
    \[
    \Sigma (M \times 100 \times \text{Chronic Category 1}) + \Sigma (10 \times \text{Chronic Category 2}) + \Sigma \text{Chronic Category 3} \geq 25\%
    \]

Numerous uses were identified for Zn₃(PO₄)₂. These are listed in the table below. Recommended uses by the SNCZ for downstream channel are in the e-SDS

- Identified uses for Zn₃(PO₄)₂ and corresponding Generic Exposure Scenario (GES)
  - IU: 10 Laboratory reagent; **GES code: 3**
  - IU: 14 Component for production of Coatings / paints, inks, enamels, varnishes; **GES code: 1**
  - IU: 15-16 Use of Zn₃(PO₄)₂ containing paints & coatings; **GES code: 7**, and Generic consumer/environment
  - IU: 19 Additive for the formulation of fertilizers; **GES code: 1**
  - IU: 20 Use of Zn₃(PO₄)₂ containing fertilizer's formulations; GES code: Generic consumer/environment

* corresponds to “GES 8” in IUCLID

**GERMANY:**

- **Wassergefährdungsklasse WGK (VwVwS):** WGK 2 – water pollutant – in accordance with annex 3, German VwVwS.
16. FURTHER INFORMATION (Continued)

USA:
- RTECS n°: TD 0590000 (Register of Toxical Effects of Chemical Substances).
- Substance listed in the Toxic Substances Control Act Inventory (TSCA) (USA).
- Cercla hazard rating (scale 0-3): Toxicity 2 - Flammability 0 - Reactivity 0 - Persistence 3

HMIS Rating : H = 0 - F = 0 - PH = 0.

HMIS III: The HMIS III ratings are from the HMIS Third Edition. There have been significant changes made to the system. "PH" stands for "Physical Hazard" as defined in the OSHA Haz Com Standard and replaces the former code "R" for "Reactivity". For a more detailed explanation of the system and the ratings, please contact our Offices at: INT = 33 1 30 40 57 57.

International status of the product:
- Australia: Listed in the AICS.
- Canada: Domestic Substance List (DSL).
- Europ (EC): EINECS registered substance.
- This substance meets with RoHS (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment) directive (2002/95/CE) for Lead, Cadmium, hexavalent Chromium, Mercury, Diphenylethers Polybrominated and Polybromated Biphenyls.
- Japan: Listed in the MITI.
- USA: TSCA registered

End of safety data sheet

The information contained herein is based on the present state of our knowledge, but without liability.

Modifications compare to the former version:
- □: Addition
- ▼: Text modification
1. LOCAL SCENARIOS SUMMARY FOR ZINC PHOSPHATE

In table below, the generic exposure scenarios (GES) developed for trizinc bis(orthophosphate) are summarised.

Table 1. Generic exposure scenarios for trizinc bis(orthophosphate) GES $\text{Zn}_3(\text{PO}_4)_2$

<table>
<thead>
<tr>
<th>ES Number</th>
<th>Sector</th>
<th>Uses</th>
<th>GES Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Formulation step</td>
<td>Formulation general</td>
<td>GES 1</td>
</tr>
<tr>
<td>3</td>
<td>First tier applications</td>
<td>Laboratory reagent</td>
<td>GES 3</td>
</tr>
<tr>
<td>7</td>
<td>Second tier applications</td>
<td>DU of $\text{Zn}_3(\text{PO}_4)_2$ containing liquid &amp; pasty preparations</td>
<td>GES 7</td>
</tr>
</tbody>
</table>

Numerous uses were identified for $\text{Zn}_3(\text{PO}_4)_2$. These are listed in table below, with the indication of the Generic Exposure Scenario (GES) that is relevant to these identified uses.

Table 2. Identified uses for $\text{Zn}_3(\text{PO}_4)_2$ and corresponding Generic Exposure Scenario (GES)

<table>
<thead>
<tr>
<th>IU number</th>
<th>Identified Use (IU) name</th>
<th>GES code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Laboratory reagent</td>
<td>GES 3</td>
</tr>
<tr>
<td>14</td>
<td>Component for production of Coatings / paints, inks, enamels, varnishes</td>
<td>GES 1</td>
</tr>
<tr>
<td>15-16</td>
<td>Use of $\text{Zn}_3(\text{PO}_4)_2$ containing paints &amp; coatings</td>
<td>GES 7, Generic consumer/environment*</td>
</tr>
<tr>
<td>19</td>
<td>Additive for the formulation of fertilizers</td>
<td>GES 1</td>
</tr>
<tr>
<td>20</td>
<td>Use of $\text{Zn}_3(\text{PO}_4)_2$ containing fertilizer's formulations</td>
<td>Generic consumer/environment</td>
</tr>
</tbody>
</table>

* corresponds to "GES 8" in IUCLID

Use descriptor system glossary:
(for more details see Guidance on information requirements and chemical safety assessment Chapter R12: Use descriptor system May 2008):

SU3: Industrial uses: Uses of substances as such or in preparations at industrial sites
SU10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys)
SU11: Manufacture of rubber products
SU15: Manufacture of fabricated metal products, except machinery and equipment
SU16: Manufacture of computer, electronic and optical products, electrical equipment
SU17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment
SU18: Manufacture of furniture
SU19: Building and construction work
SU24: Scientific research and development
ZINC PHOSPHATE PZ20/PZW2

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PC1 Adhesives, sealants
PC9a Coatings and paints, thinners, paint removers
PC9b Fillers, putties, plasters, modelling clay
PC14 Metal surface treatment products, including galvanic and electroplating products
PC15 Non-metal-surface treatment products
PC21 Laboratory Chemicals

PROC1 Use in closed process, no likelihood of exposure
PROC2 Use in closed, continuous process with occasional controlled exposure
PROC3 Use in closed batch process (synthesis or formulation)
PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC7 Industrial spraying
PROC8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC10 Roller application or brushing
PROC13 Treatment of articles by dipping and pouring
PROC14 Production of preparations* or articles by tabletting, compression, extrusion, pelletisation
PROC26 Handling of solid inorganic substances at ambient temperature

ERC1 Manufacture of substances
ERC2 Formulation of preparations
ERC10a Wide dispersive outdoor use of long-life articles and materials with low release
ERC11a Wide dispersive indoor use of long-life articles and materials with low release
ERC12a Industrial processing of articles with abrasive techniques (low release)
ERC12b Industrial processing of articles with abrasive techniques (high release)
2. EXPOSURE SCENARIOS

2.1. GES -1: Industrial use of \( \text{Zn}_3(\text{PO}_4)_2 \) in the formulation of preparations by mixing thoroughly, dry or in a solvent, the starting materials with potentially pressing, pelletizing, sintering, possibly followed by packing.

Table 1. GES \( \text{Zn}_3(\text{PO}_4)_2 \)-1

<table>
<thead>
<tr>
<th>Exposure Scenario Format (1) addressing uses carried out by workers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title of Exposure Scenario number</strong> ( \text{Zn}_3(\text{PO}_4)_2 ).GES-1:</td>
</tr>
<tr>
<td>Industrial use of ( \text{Zn}_3(\text{PO}_4)_2 ) in the formulation of preparations by mixing thoroughly, dry or in a solvent, the starting materials with potentially pressing, pelletizing, sintering, possibly followed by packing</td>
</tr>
<tr>
<td><strong>List of all use descriptors related to the life cycle stage and all the uses under it; include market sector (by PC), if relevant;</strong></td>
</tr>
<tr>
<td><strong>SU</strong>: 3, 10</td>
</tr>
<tr>
<td><strong>PROC</strong>: 1, 2, 3, 4, 5, 8b, 9, 13, 14, 26</td>
</tr>
<tr>
<td><strong>PC</strong>: Not applicable</td>
</tr>
<tr>
<td><strong>AC</strong>: Not applicable</td>
</tr>
<tr>
<td><strong>ERC</strong>: 1,2</td>
</tr>
<tr>
<td><strong>Further explanations (if needed)</strong></td>
</tr>
<tr>
<td>( \text{Zn}_3(\text{PO}_4)_2 ) is used in the manufacture of preparations by mixing thoroughly the starting materials, followed by direct use of packaging of the preparation. Many different industrial uses are characterised by this process. Therefore these industrial uses are all covered by this generic exposure scenario</td>
</tr>
</tbody>
</table>

2.1.1 Exposure Scenario

**a) Contributing scenario (1) controlling environmental exposure for the Industrial use of \( \text{Zn}_3(\text{PO}_4)_2 \) in the formulation of preparations by mixing thoroughly, dry or in a solvent, the starting materials with potentially pressing, pelletizing, sintering, possibly followed by packing**

**Further specification:**

In the described process, the zinc phosphate is:

- Removed from the packaging and stored in silos after delivery.
- Extracted from the silo, dosed and fed with the other reagents to the mixing tank. Mixing occurs batch-wise or continuously, according the process receipt. The mixing occurs in a closed tank/chamber.
- The preparation (dry or wet (solvent/paste) matrix) is further used as such or packed for further treatment/use.

**Product characteristics**

**Product related conditions:**

\( \text{Zn}_3(\text{PO}_4)_2 \) is used in minimum 80% purity; higher grades (\( >95\% \)) are usual

**Amounts used**

**Daily and annual amount per site:**

maximum 5000 T/y

**Frequency and duration of use**

Continuous production is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.
Environment factors not influenced by risk management

**Flow rate of receiving surface water:**
default for generic scenario: 18,000 m³/d, unless specified otherwise

Other given operational conditions affecting environmental exposure

Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process (via air and waste water); dry or water based processes; conditions related to temperature and pressure; indoor or outdoor use of products; work in confined area or open air:
- All processes are performed indoor in a confined area. All residues containing zinc are recycled.
- Even when no process waters (e.g. when dry process throughout), some non-process water can be generated containing zinc (e.g. from cleaning)

Technical conditions and measures at process level (source) to prevent release

Process design aiming to prevent releases and hence exposure to the environment; this includes in particular conditions ensuring rigorous containment; performance of the containment to be specified (e.g. by quantification of a release factor in section 9.x.2 of the CSR):
- Process enclosures and closed circuits where relevant and possible.
- Dust capturing and removal techniques are applied on local exhaust ventilation on furnaces and other work areas with potential dust generation.
- Containment of liquid volumes in sumps to collect/prevent accidental spillage

Technical on site conditions and measures to reduce or limit discharges, air emissions and releases to soil

Technical measures, e.g. on site waste water and waste treatment techniques, scrubbers, filters and other technical measures aiming at reducing releases to air, sewage system, surface water or soil; this includes strictly controlled conditions (procedural and control technology) to minimise emissions; specify effectiveness of measures; specify the size of industrial sewage treatment plant (m³/d), degradation effectiveness and sludge treatment (if applicable):
- On site waste water treatment techniques can be applied to prevent releases to water (if applicable) e.g.: chemical precipitation, sedimentation and filtration (efficiency 90-99.98%).
- Air emissions are controlled by use of bag-house filters and/or other air emission abatement devices e.g. fabric (or bag) filters (up to 99% efficiency), wet scrubbers (50-99% efficiency). This may create a general negative pressure in the building.

Organizational measures to prevent/limit release from site

Specific organisational measures or measures needed to support the functioning of particular technical measures. Those measures need to be reported in particular for demonstrating strictly controlled conditions.
- In general emissions are controlled and prevented by implementing an integrated management system e.g. ISO 9000, ISO 1400X series, or alike, and, when applicable, by being IPPC-compliant.
  - Such management system should include general industrial hygiene practice e.g.:
    - information and training of workers,
    - regular cleaning of equipment and floors,
    - Procedures for process control and maintenance...
- Treatment and monitoring of releases to outside air, and exhaust gas streams (process & hygiene), according to national regulation.
- SEVESO 2 compliance, if applicable

Conditions and measures related to municipal sewage treatment plant

Size of municipal sewage system/treatment plant (m³/d); specify degradation effectiveness; sludge treatment technique (disposal or recovery); measures to limit air emissions from sewage treatment (if applicable); please note: the default size of the municipal STP (2000 m³/d) will be rarely changeable for downstream uses.
- In cases where applicable: default size, unless specified otherwise.
### Conditions and measures related to external treatment of waste for disposal

**Fraction of used amount transferred to external waste treatment for disposal:** type of suitable treatment for waste generated by workers uses, e.g. hazardous waste incineration, chemical-physical treatment for emulsions, chemical oxidation of aqueous waste; specify effectiveness of treatment:

- If any, all hazardous wastes are treated by certified contractors according to EU and national Legislation.
- Users of Zn and Zn-compounds have to favour the recycling channels of the end of life products.
- Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.

### Conditions and measures related to external recovery of waste

**Fraction of used amount transferred to external waste treatment for recovery:** specify type of suitable recovery operations for waste generated by workers uses, e.g. re-distillation of solvents, refinery process for lubricant waste, recovery of slag, heat recovery out-side waste incinerators; specify effectiveness of measure:

- All residues are recycled or handled and conveyed according to waste legislation.

### b) Contributing scenario (2) controlling worker exposure for the Industrial use of Zn$_3$(PO$_4$)$_2$ in the formulation of preparations by mixing thoroughly, dry or in a solvent, the starting materials with potentially pressing, pelletizing, sintering, possibly followed by packing

**Further specification**

Zn$_3$(PO$_4$)$_2$ is used in the manufacture of preparations by mixing thoroughly the starting materials, followed by direct use of packaging of the preparation. Many different industrial uses are characterised by this process. Therefore these industrial uses are all covered by this generic exposure scenario.

### Product characteristic

**Product related conditions, e.g. the concentration of the substance in a mixture, the physical state of that mixture (solid, liquid; if solid: level of dustiness), package design affecting exposure**

- The concentration of Zn$_3$(PO$_4$)$_2$ in the mixtures can cover a broad range (<= 5% up to >25%) depending on the application.
- The preparation can be solid or liquid.
- When the preparation is in solid state, it can be in a) powdery, b) glassy or c) pelletized form. In the powder form, it can be characterised by high dustiness in a worst case situation.

### Amounts used

**Amounts used at a workplace (per task or per shift); note: sometimes this information is not needed for assessment of worker’s exposure**

Max 5000T/y = 14T/d = 5T/shift depending on the application.

### Frequency and duration of use/exposure

**Duration per task/activity (e.g. hours per shift) and frequency (e.g. single events or repeated) of exposure**

8 hour shifts (default worst case) are assumed as starting point; it is emphasised that the real duration of exposure could be less. This has to be considered when estimating exposure.

### Human factors not influenced by risk management

**Particular conditions of use, e.g. body parts potentially exposed as a result of the nature of the activity**

Uncovered body parts: (potentially) face
### Other given operational conditions affecting workers exposure

Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process into workers environment; room volume, whether the work is carried out outdoors/indoors, process conditions related to temperature and pressure.

- elevated temperature steps (\(\approx 100^\circ C\)) can occur
- All indoor processes in confined area.

### Technical conditions and measures at process level (source) to prevent release

Process design aiming to prevent releases and hence exposure of workers; this in particular includes conditions ensuring rigorous containment; performance of containment to be specified (e.g. by quantification of residual losses or exposure)

- Process enclosures and closed circuits where relevant and possible.
- Local exhaust ventilation on furnaces and other work areas with potential dust generation, dust capturing and removal techniques.
- Containment of liquid volumes in sumps to collect/prevent accidental spillage

### Technical conditions and measures to control dispersion from source towards the worker

Engineering controls, e.g. exhaust ventilation, general ventilation; specify effectiveness of measure:

- Local exhaust ventilation systems (high efficiency 90-95%)
- Cyclones/filters (for minimizing dust emissions): efficiency: 70-90% (cyclones), 50-80% (dust filters), 85-95% (double stage, cassette filters)
- Process enclosure, especially in the drying / calcinations / packaging (potentially dusty) units
- Dust control: dust and Zn in dust needs to be measured in the workplace air (static or individual) according to national regulations.
- Special care for the general establishment and maintenance of a clean working environment by e.g.:
  - Cleaning of process equipment and workshop
- Storage of packaged Zn product in dedicated zones

### Organisational measures to prevent/limit releases, dispersion and exposure

In general integrated management systems are implemented at the workplace e.g. ISO 9000, ISO-ICS 14000, or alike, and are, when appropriate, IPPC-compliant.

Such management system would include general industrial hygiene practice e.g.:

- information and training of workers on prevention of exposure/accidents,
- procedures for control of personal exposure (hygiene measures)
- regular cleaning of equipment and floors, extended workers instruction-manuals
- procedures for process control and maintenance...
- personal protection measures (see below)
Conditions and measures related to personal protection, hygiene and health evaluation

Personal protection, e.g. wearing of gloves, face protection, full body dermal protection, goggles, respirator; specify effectiveness of measure; specify the suitable material for the PPE (where relevant) and advise how long the protective equipment can be used before replacement (if relevant)

Wearing of gloves and protective clothing is compulsory (efficiency >=90%).

With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:

- dust filter-half mask P1 (efficiency 75%)
- dust filter-half mask P2 (efficiency 90%)
- dust filter-half mask P3 (efficiency 95%)
- dust filter-full mask P1 (efficiency 75%)
- dust filter-full mask P2 (efficiency 90 %)
- dust filter-full mask P3 (efficiency 97.5%)

Eyes: safety glasses are optional
2.2 GES -3: Industrial and professional use of Zn\(_3\)(PO\(_4\))\(_2\) as active laboratory reagent in aqueous or organic media, for analysis or synthesis.

Table 1. GES Zn\(_3\)(PO\(_4\))\(_2\)-3

<table>
<thead>
<tr>
<th>Exposure Scenario Format (1) addressing uses carried out by workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title of Exposure Scenario number Zn(_3)(PO(_4))(_2).GES -3:</td>
</tr>
<tr>
<td>Industrial and professional use of Zn(_3)(PO(_4))(_2) as active laboratory reagent in aqueous or organic media, for analysis or synthesis.</td>
</tr>
<tr>
<td>List of all use descriptors related to the life cycle stage and all the uses under it; include market sector (by PC), if relevant;</td>
</tr>
<tr>
<td>SU: 3,10, 24</td>
</tr>
<tr>
<td>PROC: 1,2,3,4,5, 8a, 8b,9</td>
</tr>
<tr>
<td>PC: 21</td>
</tr>
<tr>
<td>AC: not applicable</td>
</tr>
<tr>
<td>ERC: 1, 2</td>
</tr>
</tbody>
</table>

2.2.1 Exposure Scenario

a) Contributing scenario (1) controlling environmental exposure for the Industrial and professional use of Zn\(_3\)(PO\(_4\))\(_2\) as active laboratory reagent in aqueous or organic media, for analysis or synthesis.

Further specification:

The Zn\(_3\)(PO\(_4\))\(_2\) is used for

- Analysis: sample (solid or liquid) treatment or preparation: the substance is in the sample or in the reagents
- or synthesis: manipulations are usually under ventilation (e.g. laminar flow, ventilation hood)
- The substance is used:
  - at the industrial scale, in industrial installations for air control and water treatment
  - at the professional scale by laboratories

Product characteristics

Product related conditions:

Zn\(_3\)(PO\(_4\))\(_2\) is used in minimum 80% purity; higher grades (>95%) are usual

Amounts used

Daily and annual amount per site:

- maximum 5 T/y (industrial scale)
- maximum 0.5 T/y (professional scale)

Frequency and duration of use

Use is usually intermittent but continuous use is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.

Environment factors not influenced by risk management

Flow rate of receiving surface water:

If applicable: default for generic scenario: 18,000 m\(^3\)/d, unless specified otherwise
Other given operational conditions affecting environmental exposure

Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process (via air and waste water); dry or water based processes; conditions related to temperature and pressure; indoor or outdoor use of products; work in confined area or open air:

- All processes are performed indoor in a confined area, with dedicated laboratory equipment.
- All solid residues containing zinc are recovered for recycling

Technical conditions and measures at process level (source) to prevent release

Process design aiming to prevent releases and hence exposure to the environment; this includes in particular conditions ensuring rigorous containment; performance of the containment to be specified (e.g. by quantification of a release factor in section 9x2 of the CSR):

- Process enclosures and closed circuits where relevant
- If relevant, dust capturing and removal techniques are applied on local exhaust ventilation (centralized treatment, scrubbers, filters…)
- Containment of liquid volumes to collect waste streams

Technical on site conditions and measures to reduce or limit discharges, air emissions and releases to soil

Technical measures, e.g. on site waste water and waste treatment techniques, scrubbers, filters and other technical measures aiming at reducing releases to air, sewage system, surface water or soil; this includes strictly controlled conditions (procedural and control technology) to minimise emissions; specify effectiveness of measures; specify the size of industrial sewage treatment plant (m$^3$/d), degradation effectiveness and sludge treatment (if applicable):

- On site waste water treatment techniques are (if applicable) e.g.: chemical precipitation, sedimentation, filtration (efficiency 90-99.98%).
- Containment of liquid volumes in sumps to collect/prevent accidental spillage
- Air emissions are controlled by use of bag-house filters and/or other air emission abatement devices e.g. fabric (or bag) filters (up to 99% efficiency), wet scrubbers (50-99% efficiency). This may create a general negative pressure in the building. Air emissions are continuously monitored

Organizational measures to prevent/limit release from site

Specific organisational measures or measures needed to support the functioning of particular technical measures. Those measures need to be reported in particular for demonstrating strictly controlled conditions.

- In general emissions are controlled and prevented by implementing an integrated management system e.g. ISO 9000, ISO 1400X series, or alike, and, when applicable, by being IPPC-compliant.
  - Such management system should include general industrial hygiene practice e.g.:
    - information and training of workers,
    - regular cleaning of equipment and floors,
    - Procedures for process control and maintenance...
- Treatment and monitoring of releases to outside air, and exhaust gas streams (process & hygiene), according to national regulation.
- SEVESO 2 compliance, if applicable

Conditions and measures related to municipal sewage treatment plant

Size of municipal sewage system/treatment plant (m$^3$/d); specify degradation effectiveness; sludge treatment technique (disposal or recovery); measures to limit air emissions from sewage treatment (if applicable); please note: the default size of the municipal STP (2000 m$^3$/d) will be rarely changeable for downstream uses.

- In cases where applicable: default size, unless specified otherwise
### Conditions and measures related to external treatment of waste for disposal

**Fraction of used amount transferred to external waste treatment for disposal:**
Type of suitable treatment for waste generated by workers uses, e.g. hazardous waste incineration, chemical-physical treatment for emulsions, chemical oxidation of aqueous waste; specify effectiveness of treatment:

- If any, all hazardous wastes are treated by certified contractors according to EU and national legislation.
- Users of Zn and Zn-compounds have to favour the recycling channels of the end of life products.
- Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.

### Conditions and measures related to external recovery of waste

**Fraction of used amount transferred to external waste treatment for recovery:**
Specify type of suitable recovery operations for waste generated by workers uses, e.g. re-distillation of solvents, refinery process for lubricant waste, recovery of slag, heat recovery out-side waste incinerators; specify effectiveness of measure:

- All residues are recycled or handled and conveyed according to waste legislation.

b) Contributing scenario (2) controlling worker exposure for the Industrial use of Zn₃(PO₄)₂ as active laboratory reagent in aqueous or organic media, for analysis or synthesis.

### Product characteristic

**Product related conditions:** e.g. the concentration of the substance in a mixture, the physical state of that mixture (solid, liquid; if solid: level of dustiness), package design affecting exposure:

- Zn₃(PO₄)₂ is used in minimum 80% purity; higher grades (>95%) are usual
- The sample can be solid or liquid.
- When the preparation is in solid state, it can be in a) powdery, b) glassy or c) pelletized form. In the powder form, it can be characterised by high dustiness in a worst case situation.

### Amounts used

**Amounts used at a workplace (per task or per shift):**
Note: sometimes this information is not needed for assessment of worker's exposure

- maximum 5 T/y (industrial scale)
- maximum 0.5 T/y (professional scale)

### Frequency and duration of use/exposure

**Duration per task/activity (e.g. hours per shift) and frequency (e.g. single events or repeated) of exposure**

Use is usually intermittent but continuous use is assumed as a worst case. It is possible that use is not continuous; this has to be considered when estimating exposure.

### Human factors not influenced by risk management

**Particular conditions of use, e.g. body parts potentially exposed as a result of the nature of the activity**

- Uncovered body parts: (potentially) face

### Other given operational conditions affecting workers exposure

**Other given operational conditions:** e.g. technology or process techniques determining the initial release of substance from process into workers environment; room volume, whether the work is carried out outdoors/indoors, process conditions related to temperature and pressure.

- high temperature steps can occur in protected zones (fume cupboards);
- all indoor processes in confined area, including hazardous substances cabinets.
**Technical conditions and measures at process level (source) to prevent release**

Process design aiming to prevent releases and hence exposure of workers; this in particular includes conditions ensuring rigorous containment; performance of containment to be specified (e.g. by quantification of residual losses or exposure)

- Process enclosures and closed circuits where relevant and possible.
- Local exhaust ventilation on work areas with potential generation of dust or fumes, dust capturing and removal techniques (fume cupboards).
- Containment of liquid volumes and collection in special circuits

**Technical conditions and measures to control dispersion from source towards the worker**

Engineering controls, e.g. exhaust ventilation, general ventilation; specify effectiveness of measure

- Local exhaust ventilation systems are provided where needed on the benches and in the fume cupboards.
- Process enclosures if relevant
- Dust control: dust to be measured in the workplace air according to national regulations.
- Special care for the general establishment and maintenance of a clean working environment by e.g.
  - Cleaning of process equipment and laboratory
- Storage of Zn products in dedicated zones, e.g.: hazardous substances cabinets

**Organisational measures to prevent /limit releases, dispersion and exposure**

In general integrated management systems are implemented at the workplace e.g. ISO 9000/9001, ISO-ICS 14000, or alike, and are, when appropriate, IPPC-compliant.

Such management system would include general industrial hygiene practice e.g.:

- information and training of personal on prevention of exposure/accidents,
- procedures for control of personal exposure (hygiene measures)
- regular cleaning of equipment and floors, extended workers instruction-manuals
- procedures for process control and maintenance,...
- personal protection measures (see below)

**Conditions and measures related to personal protection, hygiene and health evaluation**

Personal protection, e.g. wearing of gloves, face protection, full body dermal protection, goggles, respirator; specify effectiveness of measure; specify the suitable material for the PPE (where relevant) and advise how long the protective equipment can be used before replacement (if relevant)

Wearing of protective clothing is compulsory (efficiency >=90%).

Gloves can be used occasionally if risk for direct contact with the substance

With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:

- Dust filter-half mask P1 (efficiency 75%)
- Dust filter-half mask P2 (efficiency 90%)
- Dust filter-half mask P3 (efficiency 95%)
- Dust filter-full mask P1 (efficiency 75%)
- Dust filter-full mask P2 (efficiency 90 %)
- Dust filter-full mask P3 (efficiency 97.5%)

Eyes: safety glasses are optional but usually taken as "normal laboratory practice"
2.3 GES -7: Industrial and professional use of dispersions, pastes and polymerised substrates containing less than 25%w/w of Zn\(_3(PO_4)_2\).

Table 1 GES Zn\(_3(PO_4)_2\) -7

<table>
<thead>
<tr>
<th>Exposure Scenario Format (1) addressing uses carried out by workers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title of Exposure Scenario number</strong> Zn(_3(PO_4)_2) GES 7:</td>
</tr>
<tr>
<td>Industrial and professional use of dispersions, pastes and polymerised substrates containing less than 25%w/w of Zn(_3(PO_4)_2).</td>
</tr>
</tbody>
</table>

List of all use descriptors related to the life cycle stage and all the uses under it; include market sector (by PC), if relevant;

**SU:** 3, 10, 15, 16, 17, 18, 19  
**PROC:** 4, 5, 7, 8b, 9, 10, 13  
**PC:** 1, 9a, 9b, 14, 15  
**ERC:** 10a, 11a, 12a, 12b

2.6.1. Exposure Scenario

**a) Contributing scenario (1) controlling environmental exposure for the Industrial and professional use of dispersions, pastes and polymerised substrates containing less than 25%w/w of Zn\(_3(PO_4)_2\)**

Further specification:

This scenario covers both the industrial scale processes and professional use. In the described process, the containing preparation/mixture is further processed, involving potentially the following steps:

- Reception/unpacking of material  
- Final application, spraying, embedding or to produce the end product or article.

**Product characteristics**

**Product related conditions:**

Zn\(_3(PO_4)_2\) (or Zn compound) in the article is < 25%  

**Amounts used**

**Daily and annual amount per site:**

- The quantities involved in this scenario are 10-50 times smaller than in blending (Annual amount 5000T/y for: GES 4 15T/d=5T/shift depending of application “As component for solid blends & matrices” and GES 5 20T/d=7T/shift depending of application “As component for solid blends & matrices”); the concentration of the zinc substance is also lower (<25%).
- Typical quantities for both industrial and professional are 50T/y (typical), maximum 500T/y (in industrial setting).

**Frequency and duration of use**

Continuous production is assumed as a worst case. Usually, use is not continuous; this has to be considered when estimating exposure.

**Environment factors not influenced by risk management**

**Flow rate of receiving surface water:**

default for generic scenario: 18,000 m\(^3\)/d, unless specified otherwise

**Other given operational conditions affecting environmental exposure**

**Other given operational conditions:** e.g. technology or process techniques determining the initial release of substance from process (via air and waste water); dry or water based processes; conditions related to temperature and pressure; indoor or outdoor use of products; work in confined area or open air:

- Wet processes. All process and non-process waters should be recycled internally to a maximal extent. Even when no process waters occur, some non-process water can be generated containing zinc (e.g. from cleaning).
- In industrial and professional setting, all processes are performed in a confined area. All residues containing zinc are recycled.

**Technical conditions and measures at process level (source) to prevent release**
Process design aiming to prevent releases and hence exposure to the environment; this includes in particular conditions ensuring rigorous containment; performance of the containment to be specified (e.g. by quantification of a release factor in section 9.x. 2 of the CSR):

In industrial and professional setting the following applies:
- Process enclosures where relevant and possible
- Local exhaust ventilation on furnaces and other work areas with potential dust generation.
- Dust capturing and removal techniques are applied.
- Containment of liquid volumes in sumps to collect/prevent accidental spillage

Technical on site conditions and measures to reduce or limit discharges, air emissions and releases to soil

Technical measures, e.g. on site waste water and waste treatment techniques, scrubbers, filters and other technical measures aiming at reducing releases to air, sewage system, surface water or soil; this includes strictly controlled conditions (procedural and control technology) to minimise emissions; specify effectiveness of measures; specify the size of industrial sewage treatment plant (m³/d), degradation effectiveness and sludge treatment (if applicable):

- In industrial and professional setting, the following applies:
  - If zinc emissions to water, on site waste water treatment techniques can be applied to prevent releases to water (if applicable) e.g.: chemical precipitation, sedimentation and filtration (efficiency 90-99.98%).
    - By exposure modelling it is predicted that at use quantities of >100T/y, refinement of the exposure assessment to water and sediment needs to be made (exposure assessment based on real measured data and local parameters). Treatment of the emissions to water may be needed under such conditions (see "exposure estimation and risk characterisation").
  - Air emissions are controlled by use of bag-house filters and/or other air emission abatement devices e.g. fabric or bag filters, wet scrubbers. This may create a general negative pressure in the building.

Organizational measures to prevent/limit release from site

Specific organisational measures or measures needed to support the functioning of particular technical measures. Those measures need to be reported in particular for demonstrating strictly controlled conditions.

In general, emissions are controlled and prevented by implementing an appropriate management system. This would involve:
- information and training of workers,
- regular cleaning of equipment and floors,
- procedures for process control and maintenance...
- Treatment and monitoring of releases to outside air, and exhaust gas streams, according to national regulation.
- SEVESO 2 compliance, if applicable.

Conditions and measures related to municipal sewage treatment plant

Size of municipal sewage system/treatment plant (m³/d); specify degradation effectiveness; sludge treatment technique (disposal or recovery); measures to limit air emissions from sewage treatment (if applicable);

Please note: the default size of the municipal STP (2000 m³/d) will be rarely changeable for downstream uses.

In cases where applicable: default size, unless specified otherwise.

Conditions and measures related to external treatment of waste for disposal

Fraction of used amount transferred to external waste treatment for disposal; type of suitable treatment for waste generated by workers uses, e.g. hazardous waste incineration, chemical-physical treatment for emulsions, chemical oxidation of aqueous waste; specify effectiveness of treatment:

- If any, all hazardous wastes are treated by certified contractors according to EU and national legislation.
- Users of Zn and Zn-compounds have to favour the recycling channels of the end of life products
- Users of Zn and Zn-compounds have to minimize Zn-containing waste, promote recycling routes and, for the remaining, dispose the waste streams according the Waste regulation.
### Conditions and measures related to external recovery of waste

Fraction of used amount transferred to external waste treatment for recovery: specify type of suitable recovery operations for waste generated by workers uses, e.g. re-distillation of solvents, refinery process for lubricant waste, recovery of slag, heat recovery outside waste incinerators; specify effectiveness of measure

All residues are recycled or handled and conveyed according to waste legislation.

### b) Contributing scenario (2) controlling worker exposure for the Industrial and professional use of dispersions, pastes and polymerised substrates containing less than 25%w/w of Zn₃(PO₄)₂.

### Product characteristic

Product related conditions, e.g. the concentration of the substance in a mixture, the physical state of that mixture (solid, liquid; if solid: level of dustiness), package design affecting exposure

The concentration of Zn₃(PO₄)₂ (or Zn compound) in the mixture is < 25%
- Particles can occur sporadically, the low level of dustiness is basically applied.
- Most of the processes imply the use of solutions or pastes; the "solution status" is therefore taken as the worst case.

### Amounts used

Amounts used at a workplace (per task or per shift); note: sometimes this information is not needed for assessment of worker's exposure

- The quantities involved in this scenario are 10-50 times smaller than in blending (Annual amount 5000T/y for: GES 4 15T/d=5T/shift depending of application “As component for solid blends & matrices” and GES 5 20T/d=7T/shift depending of application “As component for solid blends & matrices”); the concentration of the zinc substance is also lower (<25%).
- Typical quantities for both Industrial and professional are 50 T/y (typical), or 0.15 T/day, 0.05 T/shift.
- Maximum use quantity is 500T/y (1.5T/d, 0.5T/shift) in industrial setting.

### Frequency and duration of use/exposure

Duration per task/activity (e.g. hours per shift) and frequency (e.g. single events or repeated) of exposure

8 hour shifts (default worst case) are assumed as starting point; it is emphasised that the real duration of exposure could be less. This has to be considered when estimating exposure.

### Human factors not influenced by risk management

Uncovered body parts: (potentially) face

### Other given operational conditions affecting workers exposure

Other given operational conditions: e.g. technology or process techniques determining the initial release of substance from process into workers environment; room volume, whether the work is carried out outdoors/indoors, process conditions related to temperature and pressure.

- Industrial / Professional:
  - Wet processes, all indoor in confined area.

### Technical conditions and measures at process level (source) to prevent release

Process design aiming to prevent releases and hence exposure of workers; this in particular includes conditions ensuring rigorous containment; performance of containment to be specified (e.g. by quantification of residual losses or exposure)

Industrial / professional:
- Local exhaust ventilation on work areas with potential dust generation, dust capturing and removal techniques
- Process enclosures where appropriate
**Technical conditions and measures to control dispersion from source towards the worker**

**Engineering controls, e.g. exhaust ventilation, general ventilation; specify effectiveness of measure**

Industrial / professional:
- Local exhaust ventilation systems and process enclosures are generally applied
- Cyclones/filters (for minimizing dust emissions): efficiency 70%-90% (cyclones); dust filters (50-80%)
- LEV in work area: efficiency 84% (generic LEV)

**Organisational measures to prevent /limit releases, dispersion and exposure**

Specific organisational measures or measures needed to support the functioning of particular technical measures (e.g. training and supervision). Those measures need to be reported in particular for demonstrating strictly controlled conditions (to justify exposure based waiving).

In general, management systems are implemented; They include general industrial hygiene practice e.g.:
- information and training of workers on prevention of exposure/accidents,
- procedures for control of personal exposure (hygiene measures)
- regular cleaning of equipment and floors, extended workers instruction-manuals
- procedures for process control and maintenance...
- personal protection measures (see below)

**Conditions and measures related to personal protection, hygiene and health evaluation**

Personal protection, e.g. wearing of gloves, face protection, full body dermal protection, goggles, respirator; specify effectiveness of measure; specify the suitable material for the PPE (where relevant) and advise how long the protective equipment can be used before replacement (if relevant)

Wearing of gloves and protective clothing is compulsory (efficiency $\geq 90\%$).

With normal handling, no respiratory personal protection (breathing apparatus) is necessary. If risk for exceedance of OEL/DNEL, use e.g.:

- dust filter-half mask P1 (efficiency 75%)
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- dust filter-full mask P1 (efficiency 75%)
- dust filter-full mask P2 (efficiency 90%)
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Eyes: safety glasses are optional

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End of Extended Data Sheet