

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1. Product identifier**

Product form : Mixture
Name : Ammonia, aqueous solution <25%
EC-No. : 215-647-6
CAS-No. : 1336-21-6

1.2. Relevant identified uses of the substance or mixture and uses advised against**1.2.1. Relevant identified uses**

Main use category : Formulation, Intermediate, Industrial use, Professional use

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

OCI Nitrogen B.V.
Poststraat 1
NL- 6135 KR Sittard
The Netherlands
T +31 (0) 46 7020111
info.agro@oci-global.com - www.oci-global.com

1.4. Emergency telephone number

Emergency number : Alert & Care Centre Chemelot (Geleen, The Netherlands): +31 (0) 46 4765555 (24/7)

| Country | Organisation/Company | Address | Emergency number | Comment |
|----------------|--|--|--|------------------|
| Ireland | National Poisons Information Centre Beaumont Hospital | PO Box 1297 Beaumont Road 9 Dublin | +353 1 809 2566 (Healthcare professionals- 24/7) +353 1 809 2166 (public, 8am - 10pm, 7/7) | |
| United Kingdom | NHS 111/NHS 24/NHS Direct | | 111 0845 4647 | or call a doctor |
| Wales | National Health Service (NHS) | | 0845 46 47 | |

SECTION 2: Hazards identification**2.1. Classification of the substance or mixture****Classification according to Regulation (EC) No. 1272/2008 [CLP]**

Acute toxicity (inhal.), Category 4 H332
Skin corrosion/irritation, Category 1, Sub-Category 1B H314
Specific target organ toxicity – Single exposure, Category 3, Respiratory tract irritation H335
Hazardous to the aquatic environment – Chronic Hazard, Category 3 H412

Full text of H- and EUH-statements: see section 16

Adverse physicochemical, human health and environmental effects

May cause respiratory irritation. Causes severe skin burns and eye damage. Causes serious eye damage. Harmful to aquatic life with long lasting effects.

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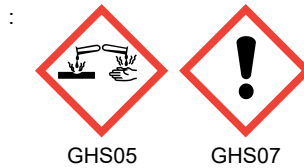
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2.2. Label elements

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

Hazard pictograms (CLP)



Signal word (CLP)

: Danger

Contains

: Ammonia, anhydrous

Hazard statements (CLP)

: H314 - Causes severe skin burns and eye damage.
H332 - Harmful if inhaled.
H335 - May cause respiratory irritation.
H412 - Harmful to aquatic life with long lasting effects.

Precautionary statements (CLP)

: P261 - Avoid breathing mist, vapours.
P280 - Wear protective clothing, eye protection, face protection, protective gloves.
P301+P330+P331+P310 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER.
P303+P361+P353+P310 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a POISON CENTER.
P305+P351+P338+P310 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER.
P321 - Specific treatment (see supplemental first aid instruction on this label).

2.3. Other hazards

This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII

This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

Contains no PBT and/or vPvB substances $\geq 0.1\%$ assessed in accordance with REACH Annex XIII

The mixture does not contain substance(s) included in the list established in accordance with Article 59(1) of REACH for having endocrine disrupting properties, or is not identified as having endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at a concentration equal to or greater than 0,1 %

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

| Name | Product identifier | Conc. (% w/w) | Classification according to Regulation (EC) No. 1272/2008 [CLP] |
|--|--|---------------|---|
| Ammonia, anhydrous substance with national workplace exposure limit(s) (AT, BE, BG, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GI, GR, HR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SI, SK); substance with a Community workplace exposure limit | CAS-No.: 7664-41-7 EC-No.: 231-635-3 EC Index-No.: 007-001-00-5 REACH-no: 01-2119488876-14-0040 | < 25 | Flam. Gas 2, H221 Press. Gas Acute Tox. 3 (Inhalation), H331 Skin Corr. 1B, H314 Aquatic Acute 1, H400 Aquatic Chronic 2, H411 |

Full text of H- and EUH-statements: see section 16

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SECTION 4: First aid measures

4.1. Description of first aid measures

| | |
|---------------------------------------|---|
| First-aid measures general | : Call a physician immediately. Give first-aid treatment according to the nature of the injury. Large amounts: Rinse with plenty of water. Flush with Diphothérine®. Small amounts: Flush with Diphothérine®. It may be dangerous to give mouth-to-mouth resuscitation. |
| First-aid measures after inhalation | : Call a physician immediately. Remove person to fresh air and keep comfortable for breathing. |
| First-aid measures after skin contact | : Call a physician immediately. Large amounts: Rinse skin with water/shower. Flush clothing with plenty of water. Flush with Diphothérine®. Small amounts: Flush with Diphothérine®. Take off immediately all contaminated clothing. |
| First-aid measures after eye contact | : Call a physician immediately. Flush with Diphothérine®. Contact lenses should be removed. |
| First-aid measures after ingestion | : Call a physician immediately. Rinse mouth. Do not induce vomiting. |

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

| | |
|-------------------------------------|---|
| Symptoms/effects after inhalation | : May cause respiratory irritation. Coughing, sneezes. Difficulty in breathing. |
| Symptoms/effects after skin contact | : Burns. |
| Symptoms/effects after eye contact | : Serious damage to eyes. |
| Symptoms/effects after ingestion | : Burns. |

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

Treat symptomatically. Symptoms may be delayed.

SECTION 5: Firefighting measures

5.1. Extinguishing media

| | |
|------------------------------|--|
| Suitable extinguishing media | : Water spray. Dry powder. Foam. Carbon dioxide. |
|------------------------------|--|

5.2. Special hazards arising from the substance or mixture

| | |
|--|---|
| Fire hazard | : Flammable gas. Heating will cause a rise in pressure with a risk of bursting. |
| Hazardous decomposition products in case of fire | : Toxic fumes may be released. Nitrogen oxides. Hydrogen. Amines. |

5.3. Advice for firefighters

| | |
|--------------------------------|---|
| Firefighting instructions | : Use water spray or fog for cooling exposed containers. Prevent fire fighting water from entering the environment. Suppress the vapours given off, with vaporised water. |
| Protection during firefighting | : Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing. |

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

| | |
|----------------------|--|
| Emergency procedures | : Evacuate unnecessary personnel. Ventilate spillage area. Avoid contact with skin and eyes. Do not breathe mist, spray, vapours. Wear personal protective equipment. Stay upwind/keep distance from source. |
|----------------------|--|

6.1.2. For emergency responders

| | |
|----------------------|---|
| Protective equipment | : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection". |
|----------------------|---|

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

| | |
|-----------------|--|
| For containment | : Collect spillage. Stop leak without risks if possible. |
|-----------------|--|

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Methods for cleaning up : Ventilate the area thoroughly. Take up liquid spill into absorbent material, e.g.: sand. Shovel or sweep up and put in a closed container for disposal.

Other information : Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

See sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Handle in accordance with good industrial hygiene and safety procedures. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only outdoors or in a well-ventilated area. Avoid contact with eyes. Do not breathe spray, mist, vapours. Wear personal protective equipment.

Hygiene measures : Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store in accordance with local, regional, national or international regulation. Keep container tightly closed. Keep cool. Store in a dry, well ventilated place away from sources of heat, ignition and direct sunlight.

Incompatible materials : Refer to Section 10 on Incompatible Materials.

Storage temperature : < 25 °C

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.1.1 National occupational exposure and biological limit values

| Ammonia, anhydrous (7664-41-7) | |
|--|---|
| EU - Indicative Occupational Exposure Limit (IOEL) | |
| Local name | Ammonia, anhydrous |
| IOELV TWA (mg/m ³) | 14 mg/m ³ |
| IOELV TWA (ppm) | 20 ppm |
| IOELV STEL (mg/m ³) | 36 mg/m ³ |
| IOELV STEL (ppm) | 50 ppm |
| Regulatory reference | COMMISSION DIRECTIVE 2000/39/EC |
| Ireland - Occupational Exposure Limits | |
| Local name | Ammonia, anhydrous |
| OEL (8 hours ref) (mg/m ³) | 14 mg/m ³ |
| OEL (8 hours ref) (ppm) | 20 ppm |
| OEL (15 min ref) (mg/m ³) | 36 mg/m ³ |
| OEL (15 min ref) (ppm) | 50 ppm |
| Remark | IOELV (Indicative Occupational Exposure Limit Values) |
| Regulatory reference | Chemical Agents Code of Practice 2021 |

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Ammonia, anhydrous (7664-41-7)

United Kingdom - Occupational Exposure Limits

| | |
|-------------------------------|---------------------------------------|
| Local name | Ammonia, anhydrous |
| WEL TWA (mg/m ³) | 18 mg/m ³ |
| WEL TWA (ppm) | 25 ppm |
| WEL STEL (mg/m ³) | 25 mg/m ³ |
| WEL STEL (OEL STEL) [ppm] | 35 ppm |
| Regulatory reference | EH40/2005 (Fourth edition, 2020). HSE |

8.1.2. Recommended monitoring procedures

No additional information available

8.1.3. Air contaminants formed

No additional information available

8.1.4. DNEL and PNEC

Ammonia, aqueous solution <25% (1336-21-6)

DNEL/DMEL (Workers)

| | |
|--|--------------------------|
| Acute - systemic effects, dermal | 6.8 mg/kg bodyweight/day |
| Acute - systemic effects, inhalation | 47.6 mg/m ³ |
| Acute - local effects, inhalation | 36 mg/m ³ |
| Long-term - systemic effects, dermal | 6.8 mg/kg bodyweight/day |
| Long-term - systemic effects, inhalation | 47.6 mg/m ³ |
| Long-term - local effects, inhalation | 14 mg/m ³ |

PNEC (Water)

| | |
|--------------------------------------|--------------|
| PNEC aqua (freshwater) | 0.00135 mg/l |
| PNEC aqua (marine water) | 0.00135 mg/l |
| PNEC aqua (intermittent, freshwater) | 0.0083 mg/l |

PNEC (Soil)

| | |
|-----------|------------------|
| PNEC soil | 0.0221 mg/kg dwt |
|-----------|------------------|

8.1.5. Control banding

No additional information available

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Appropriate engineering controls:

Ensure adequate ventilation, especially in confined areas. Use in a closed system. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Portable Diphoterine® eyewashers. Use spark-/explosionproof appliances and lighting system.

8.2.2. Personal protection equipment

Personal protective equipment symbol(s):



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8.2.2.1. Eye and face protection

Eye protection:

Tightly fitting safety goggles

| Eye protection | | | |
|----------------|----------|-----------------|----------|
| Type | Use | Characteristics | Standard |
| Safety goggles | Splashes | | EN 166 |

8.2.2.2. Skin protection

Skin and body protection:

Wear suitable protective clothing

| Skin and body protection | |
|--|----------|
| Type | Standard |
| Long sleeved protective clothing, chemical resistant, Apron, Boots | EN 13034 |

Hand protection:

Wear protective gloves

| Hand protection | | | | | |
|-------------------|--------------|-------------------|----------------|-------------|----------|
| Type | Material | Permeation | Thickness (mm) | Penetration | Standard |
| Protective gloves | Butyl rubber | 5 (> 240 minutes) | 0.56 | | EN 374 |
| Protective gloves | Viton® II | 5 (> 240 minutes) | 0.46 | | EN 374 |

8.2.2.3. Respiratory protection

Respiratory protection:

In case of insufficient ventilation, wear suitable respiratory equipment

| Respiratory protection | | | |
|---|-----------------------------|-----------|----------|
| Device | Filter type | Condition | Standard |
| Self-contained breathing apparatus (SCBA) | Type K - Ammonia and amines | | EN 402 |

8.2.2.4. Thermal hazards

No additional information available

8.2.3. Environmental exposure controls

Environmental exposure controls:

Avoid release to the environment. No restriction on the extinguishing media to be used.

Other information:

Ensure staff are informed of and trained on the nature of exposure and basic actions to minimise exposure. Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Wash hands immediately after handling the product.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

| | |
|-----------------|----------------------------|
| Physical state | : Liquid |
| Colour | : Colourless |
| Appearance | : Aqueous solution |
| Odour | : Characteristic, stinging |
| Odour threshold | : 5 – 25 ppm |
| Melting point | : Not applicable |

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| | |
|---|-----------------------------|
| Freezing point | : Not available |
| Boiling point | : Not available |
| Flammability (solid, gas) | : Not applicable |
| Explosive properties | : Not explosive |
| Oxidising properties | : Non oxidizing |
| Lower explosive limit (LEL) | : Not available |
| Upper explosive limit (UEL) | : Not available |
| Flash point | : Not available |
| Auto-ignition temperature | : 651 °C ammonia, anhydrous |
| Decomposition temperature | : 450 °C ammonia, anhydrous |
| pH | : Not available |
| pH solution | : alkaline |
| Viscosity, kinematic | : 1.333 mm ² /s |
| Viscosity, dynamic | : 1.2 mPa·s |
| Solubility | : Soluble in water |
| Partition coefficient n-octanol/water (Log Kow) | : Not available |
| Partition coefficient n-octanol/water (Log Pow) | : -2.66 |
| Vapour pressure | : Not available |
| Vapour pressure at 50°C | : Not available |
| Density | : 0.9 g/cm ³ |
| Relative density | : Not available |
| Relative vapour density at 20°C | : 0.8 |
| Relative density of saturated gas/air mixture | : 0.89 |
| Particle characteristics | : Not applicable |

9.2. Other information

9.2.1. Information with regard to physical hazard classes

No additional information available

9.2.2. Other safety characteristics

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

The product is non-reactive under normal conditions of use, storage and transport.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

10.4. Conditions to avoid

None under recommended storage and handling conditions (see section 7).

10.5. Incompatible materials

Strong acids. Strong bases. Aluminium. Chromates. Copper or copper containing metals. Halogens. Metal oxides. Nickel (Ni). Organic materials. Zinc.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire. Nitrogen oxides. Hydrogen.

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SECTION 11: Toxicological information

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

Acute toxicity (oral) : Not classified
Acute toxicity (dermal) : Not classified
Acute toxicity (inhalation) : Harmful if inhaled.

| Ammonia, aqueous solution <25% (1336-21-6) | |
|--|--------------|
| ATE CLP (gases) | 4500 ppmv/4h |
| ATE CLP (vapours) | 11 mg/l/4h |
| ATE CLP (dust,mist) | 1.5 mg/l/4h |

| Ammonia, anhydrous (7664-41-7) | |
|--------------------------------|--|
| LC50 Inhalation - Rat | 9850 mg/m ³ Ammonia/air mixture, Exposure: 1h |
| Skin corrosion/irritation | : Causes severe skin burns. |

| Ammonia, anhydrous (7664-41-7) | |
|--------------------------------|--|
| pH | 11.6 (conc: 1 N at 25 °C (aqueous solution)) |
| Serious eye damage/irritation | : Assumed to cause serious eye damage |

| Ammonia, anhydrous (7664-41-7) | |
|-----------------------------------|--|
| pH | 11.6 (conc: 1 N at 25 °C (aqueous solution)) |
| Respiratory or skin sensitisation | : Not classified |
| Germ cell mutagenicity | : Not classified |
| Carcinogenicity | : Not classified |

| Ammonia, anhydrous (7664-41-7) | |
|---|---|
| NOAEL (chronic, oral, animal/male, 2 years) | 256 mg/kg bodyweight Animal: rat, Animal sex: male, Guideline: OECD Guideline 453 (Combined Chronic Toxicity / Carcinogenicity Studies), Remarks on results: other:Effect type: toxicity (migrated information) |
| NOAEL (chronic, oral, animal/female, 2 years) | 284 mg/kg bodyweight Animal: rat, Animal sex: female, Guideline: OECD Guideline 453 (Combined Chronic Toxicity / Carcinogenicity Studies), Remarks on results: other:Effect type: toxicity (migrated information) |
| Reproductive toxicity | : Not classified |
| STOT-single exposure | : May cause respiratory irritation. |
| STOT-repeated exposure | : Not classified |
| Aspiration hazard | : Not classified |

| Ammonia, aqueous solution <25% (1336-21-6) | |
|--|--------------------------|
| Viscosity, kinematic | 1.333 mm ² /s |

11.2. Information on other hazards

11.2.1. Endocrine disrupting properties

Adverse health effects caused by endocrine disrupting properties : Contains no substances identified as having endocrine disrupting properties

11.2.2. Other information

No additional information available

SECTION 12: Ecological information

12.1. Toxicity

Hazardous to the aquatic environment, short-term (acute) : Not classified.

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Hazardous to the aquatic environment, long-term (chronic) : Harmful to aquatic life with long lasting effects.

Not rapidly degradable

| Ammonia, anhydrous (7664-41-7) | |
|--------------------------------|--|
| LC50 fish 1 | 0.068 mg/l Oncorhynchus gorboscha (96h) |
| EC50 Daphnia 1 | 101 mg/l Daphnia magna (48h) |
| EC50 72h - Algae [1] | 2700 mg/l Chlorella vulgaris (18d) |
| LOEC (chronic) | 1.3 mg/l Test organisms (species): Daphnia magna Duration: '96 h' |
| NOEC (chronic) | 0.79 mg/l Test organisms (species): Daphnia magna Duration: '96 h' |
| NOEC chronic fish | 1.2 mg/l Oncorhynchus gorboscha (96h) |

12.2. Persistence and degradability

| Ammonia, anhydrous (7664-41-7) | |
|--------------------------------|------------------------|
| Persistence and degradability | Readily biodegradable. |

12.3. Bioaccumulative potential

| Ammonia, aqueous solution <25% (1336-21-6) | |
|---|---------------------------|
| Partition coefficient n-octanol/water (Log Pow) | -2.66 |
| Ammonia, anhydrous (7664-41-7) | |
| Partition coefficient n-octanol/water (Log Pow) | 0.23 |
| Bioaccumulative potential | Bioaccumulation unlikely. |

12.4. Mobility in soil

| Ammonia, aqueous solution <25% (1336-21-6) | |
|--|---|
| Ecology - soil | Mobility in soil is expected to be limited, due to strong adsorption of ammonium ions to clay minerals and the bacterial oxidation to nitrate. Ammonium in soil is in dynamic equilibrium with nitrate and other substrates in the nitrate cycle. |

12.5. Results of PBT and vPvB assessment

| Ammonia, aqueous solution <25% (1336-21-6) | |
|--|--|
| This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII | |
| This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII | |

12.6. Endocrine disrupting properties

Adverse effects on the environment caused by endocrine disrupting properties : Contains no substances identified as having endocrine disrupting properties.

12.7. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Dispose of contents/container in accordance with licensed collector's sorting instructions.
Product/Packaging disposal recommendations : Empty containers should be taken for recycling, recovery or waste in accordance with local regulation.







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SECTION 14: Transport information

In accordance with ADR / IMDG / IATA / ADN / RID

| ADR | IMDG | IATA | ADN | RID |
|---|---|---|---|---|
| 14.1. UN number or ID number | | | | |
| UN 2672 | UN 2672 | UN 2672 | UN 2672 | UN 2672 |
| 14.2. UN proper shipping name | | | | |
| AMMONIA SOLUTION | AMMONIA SOLUTION | Ammonia solution | AMMONIA SOLUTION | AMMONIA SOLUTION |
| 14.3. Transport hazard class(es) | | | | |
| 8 | 8 | 8 | 8 | 8 |
|  |   |  |  |  |
| 14.4. Packing group | | | | |
| III | III | III | III | III |
| 14.5. Environmental hazards | | | | |
| Dangerous for the environment: No | Dangerous for the environment: No Marine pollutant: Yes | Dangerous for the environment: No | Dangerous for the environment: No | Dangerous for the environment: No |
| No supplementary information available | | | | |

14.6. Special precautions for user

Overland transport

Orange plates



EAC code

: 2R

Transport by sea

No data available

Air transport

No data available

Inland waterway transport

No data available

Rail transport

No data available

14.7. Maritime transport in bulk according to IMO instruments

Not applicable

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

Other information, restriction and prohibition regulations : For professional users only.

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REACH Annex XVII (Restriction List)

Contains no substance(s) listed on REACH Annex XVII (Restriction Conditions)

REACH Annex XIV (Authorisation List)

Contains no substance(s) listed on REACH Annex XIV (Authorisation List)

REACH Candidate List (SVHC)

Contains no substance(s) listed on the REACH Candidate List

PIC Regulation (Prior Informed Consent)

Contains no substance(s) listed on the PIC list (Regulation EU 649/2012 concerning the export and import of hazardous chemicals)

POP Regulation (Persistent Organic Pollutants)

Contains no substance(s) listed on the POP list (Regulation EU 2019/1021 on persistent organic pollutants)

Ozone Regulation (1005/2009)

Contains no substance(s) listed on the Ozone Depletion list (Regulation EU 1005/2009 on substances that deplete the ozone layer)

Explosives Precursors Regulation (2019/1148)

Contains no substance(s) listed on the Explosives Precursors list (Regulation EU 2019/1148 on the marketing and use of explosives precursors)

Drug Precursors Regulation (273/2004)

Contains no substance(s) listed on the Drug Precursors list (Regulation EC 273/2004 on the manufacture and the placing on market of certain substances used in the illicit manufacture of narcotic drugs and psychotropic substances)

15.1.2. National regulations

No additional information available

15.2. Chemical safety assessment

A chemical safety assessment has been carried out

SECTION 16: Other information

Indication of changes:

Logo. Classification. Label elements. Symptoms. DNEL. PNEC.

| Abbreviations and acronyms: | |
|-----------------------------|---|
| ADN | European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways |
| ADR | European Agreement concerning the International Carriage of Dangerous Goods by Road |
| ATE | Acute Toxicity Estimate |
| BCF | Bioconcentration factor |
| CLP | Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008 |
| DNEL | Derived-No Effect Level |
| DMEL | Derived Minimal Effect level |
| EC50 | Median effective concentration |
| IARC | International Agency for Research on Cancer |
| IATA | International Air Transport Association |
| IMDG | International Maritime Dangerous Goods |
| LC50 | Median lethal concentration |
| LD50 | Median lethal dose |
| LOAEL | Lowest Observed Adverse Effect Level |
| NOAEC | No-Observed Adverse Effect Concentration |
| NOAEL | No-Observed Adverse Effect Level |

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| Abbreviations and acronyms: | |
|-----------------------------|---|
| NOEC | No-Observed Effect Concentration |
| OECD | Organisation for Economic Co-operation and Development |
| PBT | Persistent Bioaccumulative Toxic |
| PNEC | Predicted No-Effect Concentration |
| REACH | Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006 |
| RID | Regulations concerning the International Carriage of Dangerous Goods by Rail |
| SDS | Safety Data Sheet |
| STP | Sewage treatment plant |
| vPvB | Very Persistent and Very Bioaccumulative |

| Full text of H- and EUH-statements: | |
|-------------------------------------|--|
| Acute Tox. 3 (Inhalation) | Acute toxicity (inhal.), Category 3 |
| Acute Tox. 4 (Inhalation) | Acute toxicity (inhal.), Category 4 |
| Aquatic Acute 1 | Hazardous to the aquatic environment – Acute Hazard, Category 1 |
| Aquatic Chronic 2 | Hazardous to the aquatic environment – Chronic Hazard, Category 2 |
| Aquatic Chronic 3 | Hazardous to the aquatic environment – Chronic Hazard, Category 3 |
| Flam. Gas 2 | Flammable gases, Category 2 |
| H221 | Flammable gas. |
| H314 | Causes severe skin burns and eye damage. |
| H331 | Toxic if inhaled. |
| H332 | Harmful if inhaled. |
| H335 | May cause respiratory irritation. |
| H400 | Very toxic to aquatic life. |
| H411 | Toxic to aquatic life with long lasting effects. |
| H412 | Harmful to aquatic life with long lasting effects. |
| Press. Gas | Gases under pressure |
| Skin Corr. 1B | Skin corrosion/irritation, Category 1, Sub-Category 1B |
| STOT SE 3 | Specific target organ toxicity – Single exposure, Category 3, Respiratory tract irritation |

Safety Data Sheet applicable for regions : IE - Ireland;GB - United Kingdom

SDS EU (REACH Annex II) - RHDHV

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

1. EXPOSURE SCENARIO

Exposure scenario Title 1
Manufacturing

Use descriptors

Process categories PROC1 - Use in closed process, no likelihood of exposure
PROC2 - Use in closed, continuous process with occasional controlled exposure (e.g. sampling)
PROC 8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC15 - Use as laboratory reagent

Environmental Release Category ERC1 - Manufacture of substances

2. CONDITIONS OF USE AFFECTING EXPOSURE

Product characteristics

Physical state @20°C Liquid (Solution or Compressed gas).
Concentration of substance in product Covers percentage substance in the product up to 100 % (unless stated differently).

Amounts used Site: 2000-3000 t/d
Region: 950000 t/y
Total: 6591429 t/y

Working area

Process System Indoor/outdoor use.
Continuous process.
Handle substance within a closed system.

Frequency and duration of use Manufacturing: 24 h/d, 330-360 d/y. Operator: 8-12 h/d.

General measures Assumes a good basic standard of occupational hygiene is implemented.
Workers must be trained in the proper use and handling of this product as required under applicable regulations.
Wear protective gloves/protective clothing/eye protection/face protection, Boots, Helmet.

Contributing scenarios

| Control of environmental exposure | |
|--|--|
| Environmental Release Category | ERC1 - Manufacture of substances |
| Product characteristics | Liquid |
| Amounts used | Site 2000-3000 t/d Region 950000 t/y Total 6591429 t/y |
| Frequency and duration of use | Continuous release |

| Control of worker exposure | |
|--|---|
| Process category | PROC1 - Use in closed process, no likelihood of exposure |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use Indoor use without local exhaust ventilation (LEV) |

| | |
|--|--|
| Process category | PROC2 - Use in closed, continuous process with occasional controlled exposure |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) Indoor use with local exhaust ventilation (LEV) |

| | |
|------------------|---|
| Process category | PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
|------------------|---|

Annex to the Safety Data Sheet
Exposure scenario 1: Manufacturing

| | |
|--|---|
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) |
| Process category | PROC15 - Use as laboratory reagent |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Indoor use with local exhaust ventilation (LEV) |

3. EXPOSURE ESTIMATION AND REFERENCE TO ITS SOURCE

| Environment Exposure Estimation | |
|---------------------------------|--|
| Environmental Release Category | ERC1 - Manufacture of substances |
| Release to Air | 1.44 x 10 ⁵ kg/d |
| Release to Soil | 0 |
| Release to Water | 1.73 x 10 ⁵ kg/d |
| Freshwater | PEC: 3.48 x 10 ⁻³ mg/L - Total Ammonia , 1.33 x 10 ⁻⁴ mg/L - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.121 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |
| Marine water | PEC: 7.61 x 10 ⁻⁴ mg/L - Total Ammonia , 3.15 x 10 ⁻⁵ mg/L - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.029 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |

| Health Exposure Estimation | |
|---|---|
| Process category | PROC1 - Use in closed process, no likelihood of exposure |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use <0.01 mg/m ³ , RCR: <0.01 - Respiratory Protection No Indoor use without local exhaust ventilation (LEV) 0.01 mg/m ³ , RCR: <0.01 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use / Indoor use without local exhaust ventilation (LEV) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves |

| | |
|---|---|
| Process category | PROC2 - Use in closed, continuous process with occasional controlled exposure |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.24 mg/m ³ , RCR 0.09 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.54 mg/m ³ , RCR: 0.25 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.37 mg/kg bw/d, RCR: 0.20 - No gloves Indoor use with local exhaust ventilation (LEV) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves |

| | |
|---|---|
| Process category | PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 3.27 mg/m ³ , RCR: 0.27 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.19 mg/m ³ , RCR: 0.23 - Respiratory Protection No |

Annex to the Safety Data Sheet
Exposure scenario 1: Manufacturing

| | |
|---|---|
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |
| Process category | PROC15 - Use as laboratory reagent |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Indoor use with local exhaust ventilation (LEV) 3.54 mg/m ³ , RCR: 0.25 Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Indoor use with local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves |

4. GUIDANCE TO DOWNSTREAM USER FOR EVALUATING EMPLOYEE WHETHER HE WORKS INSIDE THE BOUNDARIES SET BY THE ES

Environmental exposure

Used EUSES model: EUSUS v2.1.

Non-standard assumptions: Required removal efficiency (wastewater) 100%.

Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.

Predicted No Effect Concentration (PNEC): Water, 0.0011 mg/L (Free Ammonia). No other PNEC's derived.

Control of worker exposure

The ECETOC TRA tool has been used to estimate consumer exposures unless otherwise indicated.

Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.

Used Derived No Effect Level (DNEL):

Worker - inhalative, long-term - local,

Worker - dermal, short-term - systemic,

Worker - dermal, long-term - systemic.

Other DNEL's were not critical.

Guidance to check compliance with the exposure scenario

If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

For scaling see: ECETOC TRA, ART, STOFFENMANAGER, EUSES.

Further information on the assumptions contained in this exposure scenario can be found at: Website Model, ECETOC TRA and RIVM report 601450009, "Emission scenario document for biocides", 2001.

Workplace measurements:

Refer to European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) or equivalent national standard(s).

Refer to European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) or equivalent national standard(s).

Refer to European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) or equivalent national standard(s).

BOHS/NVVA guidance "Testing Compliance with Occupational Exposure Limits for Airborne Substances".

Workplace measurements - Method: <http://amcaw.ifa.dguv.de/substance/methoden/096-L-Ammonia.pdf>.

1. EXPOSURE SCENARIO

| | |
|---------------------------------------|---|
| Exposure scenario Title | 2 Formulation |
| Use descriptors | |
| Product category | PC1 - Adhesives, sealants PC9a - Coatings and paints, thinners, paint removers PC12 - Fertilisers PC14 - Metal surface treatment products, including galvanic and electroplating products PC16 - Heat transfer fluids PC18 - Ink and toners PC19 - Intermediates PC20 - Products such as pH-regulators, flocculants, precipitants, neutralization agents, other unspecific PC21 - Laboratory chemicals PC26 - Paper and Board dye, finishing and impregnation products including bleaches and other processing aids PC29 - Pharmaceuticals PC30 - Photochemicals PC34 - Textile dyes, finishing and impregnating products including bleaches and other processing aids PC35 - Washing and cleaning products (including solvent based products) PC37 - Water treatment chemicals PC39 - Cosmetics, personal care products PC40 - Extraction agents |
| Process categories | PROC1 - Use in closed process, no likelihood of exposure PROC2 - Use in closed, continuous process with occasional controlled exposure (e.g. sampling) PROC3 - Use in closed batch process (synthesis or formulation); Industrial setting PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC8a - Transfer of substance or mixture (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC 8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9 - Transfer of substance or mixture into small containers (dedicated filling line, including weighing) PROC15 - Use as laboratory reagent |
| Environmental Release Category | ERC2 - Formulation of mixtures |

2. CONDITIONS OF USE AFFECTING EXPOSURE

| | |
|--|--|
| Product characteristics | |
| Physical state @20°C | Liquid (Solution or Compressed gas). |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently). |
| Amounts used | Region 1000000 t/y Total 3829950 t/y |
| Working area | Indoor/outdoor use. |
| Process | Continuous process. Batch process. |
| System | Handle substance within a closed system. |
| Frequency and duration of use | Distributor: 0.25-2 h/d, 2-3 d/w. Operator: 3-6 h/d, 100 d/y. |
| General measures | Assumes a good basic standard of occupational hygiene is implemented. Workers must be trained in the proper use and handling of this product as required under applicable regulations. Wear protective gloves/protective clothing/eye protection/face protection, Boots, Helmet. |

Annex to the Safety Data Sheet
Exposure scenario 2: Formulation

Contributing scenarios

| Control of environmental exposure | |
|--|---|
| Environmental Release Category | ERC2 - Formulation of preparations (mixtures) |
| Product characteristics | Liquid |
| Amounts used | Region 1000000 t/y Total 3829950 t/y |
| Frequency and duration of use | Continuous release |

| Control of worker exposure | |
|--|---|
| Process category | PROC1 - Use in closed process, no likelihood of exposure |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use Indoor use without local exhaust ventilation (LEV) |

| | |
|--|---|
| Process category | PROC2 - Use in closed, continuous process with occasional controlled exposure PROC3 - Use in closed batch process (synthesis or formulation) |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) Indoor use with local exhaust ventilation (LEV) |

| | |
|--|---|
| Process category | PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) |

| | |
|--|---|
| Process category | PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) |

| | |
|--|---|
| Process category | PROC15 - Use as laboratory reagent |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Indoor use with local exhaust ventilation (LEV) |

3. EXPOSURE ESTIMATION AND REFERENCE TO ITS SOURCE

| Environment Exposure Estimation | |
|--|--|
| Environmental Release Category | ERC2 - Formulation of preparations (mixtures) |
| Release to Air | 7.58 x 10 ⁴ kg/d |
| Release to Soil | 0 |
| Release to Water | 6.06 x 10 ⁴ kg/d |
| Freshwater | PEC: 1.30 x 10 ⁻³ mg/L - Total Ammonia , 4.97 x 10 ⁻⁴ mg/L - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.045 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |

Annex to the Safety Data Sheet
Exposure scenario 2: Formulation

| | |
|--------------|--|
| Marine water | PEC: 3.14×10^{-4} mg/L - Total Ammonia , 1.20×10^{-5} mg/L - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.011 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |
|--------------|--|

Health Exposure Estimation

| | |
|---|---|
| Process category | PROC1 - Use in closed process, no likelihood of exposure |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use <0.01 mg/m ³ , RCR: <0.01 - Respiratory Protection No Indoor use without local exhaust ventilation (LEV) 0.01 mg/m ³ , RCR: <0.01 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use / Indoor use without local exhaust ventilation (LEV) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves |

| | |
|---|---|
| Process category | PROC2 - Use in closed, continuous process with occasional controlled exposure |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.24 mg/m ³ , RCR 0.09 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.54 mg/m ³ , RCR: 0.25 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.37 mg/kg bw/d, RCR: 0.20 - No gloves Indoor use with local exhaust ventilation (LEV) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves |

| | |
|---|--|
| Process category | PROC3 - Use in closed batch process (synthesis or formulation) |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 2.48 mg/m ³ , RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m ³ , RCR: 0.51 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves Indoor use with local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves |

| | |
|---|--|
| Process category | PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m ³ , RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m ³ , RCR: 0.06 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 1.37 mg/kg bw/d, RCR: 0.203 - No gloves |

| | |
|---|---|
| Process category | PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m ³ , RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m ³ , RCR: 0.06 - Respiratory Protection Reduction 95% |

Annex to the Safety Data Sheet
Exposure scenario 2: Formulation

| | |
|---|---|
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves |
| Process category | PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 3.72 mg/m ³ , RCR: 0.27 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.19 mg/m ³ , RCR: 0.23 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |
| Process category | PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 4.96 mg/m ³ , RCR: 0.35 - Respiratory Protection 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.71 mg/m ³ , RCR: 0.05 - Respiratory Protection Reduction 95% |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |
| Process category | PROC15 - Use as laboratory reagent |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Indoor use with local exhaust ventilation (LEV) 3.54 mg/m ³ , RCR: 0.25 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Indoor use without local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves |

4. GUIDANCE TO DOWNSTREAM USER FOR EVALUATING EMPLOYEE WHETHER HE WORKS INSIDE THE BOUNDARIES SET BY THE ES

Environmental exposure

Used EUSES model: EUSUS v2.1.

Non-standard assumptions: Required removal efficiency (wastewater) 100%.

Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.

Predicted No Effect Concentration (PNEC): Water, 0.0011 mg/L (Free Ammonia). No other PNEC's derived.

Control of worker exposure

The ECETOC TRA tool has been used to estimate consumer exposures unless otherwise indicated.

Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.

Used Derived No Effect Level (DNEL):

Worker - inhalative, long-term - local,

Worker - dermal, short-term - systemic,

Worker - dermal, long-term - systemic.

Other DNEL's were not critical.

Guidance to check compliance with the exposure scenario

If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

For scaling see: ECETOC TRA, ART, STOFFENMANAGER, EUSES.

Further information on the assumptions contained in this exposure scenario can be found at: Website Model, ECETOC TRA and RIVM report 601450009, "Emission scenario document for biocides", 2001.

Workplace measurements:

Refer to European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) or equivalent national standard(s).

Refer to European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) or equivalent national standard(s).

Refer to European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) or equivalent national standard(s).

BOHS/NVVA guidance "Testing Compliance with Occupational Exposure Limits for Airborne Substances".

Workplace measurements - Method: <http://amcaw.ifa.dguv.de/substance/methoden/096-L-Ammonia.pdf>.

1. EXPOSURE SCENARIO

| | |
|---------------------------------------|---|
| Exposure scenario Title | 3 Intermediate |
| Use descriptors | |
| Sector of use | SU1 - Agriculture, forestry, fishery SU5 - Manufacture of textiles, leather, fur SU8 - Manufacture of bulk, large scale chemicals (including petroleum products) SU9 - Manufacture of fine chemicals SU12 - Manufacture of plastics products, including compounding and conversion SU24 - Scientific research and development |
| Product category | PC19 - Intermediates |
| Process categories | PROC1 - Use in closed process, no likelihood of exposure PROC2 - Use in closed, continuous process with occasional controlled exposure (e.g. sampling) PROC3 - Use in closed batch process (synthesis or formulation); Industrial setting PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC 8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9 - Transfer of substance or mixture into small containers (dedicated filling line, including weighing) PROC15 - Use as laboratory reagent |
| Environmental Release Category | ERC6a - Industrial use resulting in manufacture of another substance (use of intermediates) |

2. CONDITIONS OF USE AFFECTING EXPOSURE

| | |
|--|--|
| Product characteristics | |
| Physical state @20°C | Liquid (Solution or Compressed gas). |
| Concentration of substance in product | Covers percentage substance in the product up to 100 % (unless stated differently). |
| Amounts used | Region: 800000 t/y Total: 6591429 t/y |
| Working area | Indoor/outdoor use. |
| Process | Continuous process. |
| System | Handle substance within a closed system. |
| Frequency and duration of use | Manufacturing: 24 h/d, 330-360 d/y. Operator: 8-12 h/d. |
| General measures | Assumes a good basic standard of occupational hygiene is implemented. Workers must be trained in the proper use and handling of this product as required under applicable regulations. Wear protective gloves/protective clothing/eye protection/face protection, Boots, Helmet. |

Contributing scenarios

| Control of environmental exposure | |
|--|---|
| Environmental Release Category | ERC6a - Industrial use resulting in manufacture of another substance (use of intermediates) |
| Product characteristics | Liquid |
| Amounts used | Site 2000-3000 t/d Region 950000 t/y Total 6591429 t/y |
| Frequency and duration of use | Continuous release |

Annex to the Safety Data Sheet
Exposure scenario 3: Intermediate

| Control of worker exposure | |
|--|--|
| Process category | PROC1 - Use in closed process, no likelihood of exposure |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Indoor use without local exhaust ventilation (LEV) Outdoor use |
| Process category | PROC2 - Use in closed, continuous process with occasional controlled exposure PROC3 - Use in closed batch process (synthesis or formulation) |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Indoor use with local exhaust ventilation (LEV) Outdoor use with respiratory protection equipment (RPE) |
| Process category | PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) |
| Process category | PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) |
| Process category | PROC15 - Use as laboratory reagent |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Indoor use with local exhaust ventilation (LEV) |

3. EXPOSURE ESTIMATION AND REFERENCE TO ITS SOURCE

| Environment Exposure Estimation | |
|--|--|
| Environmental Release Category | ERC6a - Industrial use resulting in manufacture of another substance (use of intermediates) |
| Release to Air | 1.21 x 10 ⁵ kg/d |
| Release to Water | 4.85 x 10 ⁴ kg/d |
| Freshwater | PEC: 2.19 x 10 ⁻³ mg/L - Total Ammonia , 8.37 x 10 ⁻⁴ mg/L - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.076 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |
| Marine water | PEC: 5.37 x 10 ⁻⁴ mg/L - Total Ammonia , 2.05 x 10 ⁻⁵ mg/L - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.019 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |
| Health Exposure Estimation | |
| Process category | PROC1 - Use in closed process, no likelihood of exposure |

Annex to the Safety Data Sheet
Exposure scenario 3: Intermediate

| | |
|---|---|
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use <0.01 mg/m ³ , RCR: <0.01 - Respiratory Protection No Indoor use without local exhaust ventilation (LEV) 0.01 mg/m ³ , RCR: <0.01 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use / Indoor use without local exhaust ventilation (LEV) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves |
| Process category | PROC2 - Use in closed, continuous process with occasional controlled exposure |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.24 mg/m ³ , RCR 0.09 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.54 mg/m ³ , RCR: 0.25 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.37 mg/kg bw/d, RCR: 0.20 - No gloves Indoor use without local exhaust ventilation (LEV) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves |
| Process category | PROC3 - Use in closed batch process (synthesis or formulation) |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 2.48 mg/m ³ , RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m ³ , RCR: 0.51 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves Indoor use with local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves |
| Process category | PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 2.48 mg/m ³ , RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m ³ , RCR: 0.51 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |
| Process category | PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m ³ , RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m ³ , RCR: 0.06 - Respiratory Protection Reduction 95% |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.07 mg/kg bw/d, RCR: 0.01 - No gloves |
| Process category | PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |

Annex to the Safety Data Sheet
Exposure scenario 3: Intermediate

| | |
|---|---|
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 3.72 mg/m ³ , RCR: 0.27 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.19 mg/m ³ , RCR: 0.23 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |
| Process category | PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 4.69 mg/m ³ , RCR: 0.35 - Respiratory Protection 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.71 mg/m ³ , RCR: 0.05 - Respiratory Protection Reduction 95% |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |
| Process category | PROC15 - Use as laboratory reagent |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Indoor use without local exhaust ventilation (LEV) 3.54 mg/m ³ , RCR: 0.25 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Indoor use without local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves |

4. GUIDANCE TO DOWNSTREAM USER FOR EVALUATING EMPLOYEE WHETHER HE WORKS INSIDE THE BOUNDARIES SET BY THE ES

Environmental exposure

Used EUSES model: EUSUS v2.1.
 Non-standard assumptions: Required removal efficiency (wastewater) 100%.
 Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
 Predicted No Effect Concentration (PNEC): Water, 0.0011 mg/L (Free Ammonia). No other PNEC's derived.

Control of worker exposure

The ECETOC TRA tool has been used to estimate consumer exposures unless otherwise indicated.
 Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
 Used Derived No Effect Level (DNEL):
 Worker - inhalative, long-term - local,
 Worker - dermal, short-term - systemic,
 Worker - dermal, long-term - systemic.
 Other DNEL's were not critical.

Guidance to check compliance with the exposure scenario

Annex to the Safety Data Sheet
Exposure scenario 3: Intermediate

If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

For scaling see: ECETOC TRA, ART, STOFFENMANAGER, EUSES.

Further information on the assumptions contained in this exposure scenario can be found at: Website Model, ECETOC TRA and RIVM report 601450009, "Emission scenario document for biocides", 2001.

Workplace measurements:

Refer to European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) or equivalent national standard(s).

Refer to European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) or equivalent national standard(s).

Refer to European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) or equivalent national standard(s).

BOHS/NVVA guidance "Testing Compliance with Occupational Exposure Limits for Airborne Substances".

Workplace measurements - Method: <http://amcaw.ifa.dguv.de/substance/methoden/096-L-Ammonia.pdf>.

1. EXPOSURE SCENARIO

| | |
|---------------------------------------|--|
| Exposure scenario Title | 4 Industrial use |
| Use descriptors | |
| Sector of use | SU4 - Manufacture of food products SU5 - Manufacture of textiles, leather, fur SU6a - Manufacture of wood and wood products SU6b - Manufacture of pulp, paper and paper products SU8 - Manufacture of bulk, large scale chemicals (including petroleum products) SU9 - Manufacture of fine chemicals SU13 - Manufacture of other non-metallic mineral products, e.g. plasters, cement SU15 - Manufacture of fabricated metal products, except machinery and equipment SU16 - Manufacture of computer, electronic and optical products, electrical equipment SU23 - Recycling SU0 - Other |
| Product category | PC0 - Other: Other products (production of life microorganism) PC1 - Adhesives, sealants PC9a - Coatings and paints, thinners, paint removers PC14 - Metal surface treatment products, including galvanic and electroplating products PC15 - Non-metal-surface treatment products PC16 - Heat transfer fluids PC20 - Products such as pH-regulators, flocculants, precipitants, neutralization agents, other unspecific PC26 - Paper and Board dye, finishing and impregnation products including bleaches and other processing aids PC29 - Pharmaceuticals PC30 - Photochemicals PC34 - Textile dyes, finishing and impregnating products including bleaches and other processing aids PC35 - Washing and cleaning products (including solvent based products) PC37 - Water treatment chemicals PC39 - Cosmetics, personal care products PC40 - Extraction agents |
| Process categories | PROC1 - Use in closed process, no likelihood of exposure PROC2 - Use in closed, continuous process with occasional controlled exposure (e.g. sampling) PROC3 - Use in closed batch process (synthesis or formulation); Industrial setting PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC 8b - Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at dedicated facilities PROC9 - Transfer of substance or mixture into small containers (dedicated filling line, including weighing) PROC13 - Treatment of articles by dipping and pouring |
| Environmental Release Category | ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles ERC5 - Industrial use resulting in inclusion into or onto a matrix ERC6b - Industrial use of reactive processing aids ERC7 - Industrial use of substances in closed systems |

2. CONDITIONS OF USE AFFECTING EXPOSURE

| | |
|--------------------------------|--|
| Product characteristics | |
| Physical state @20°C | Liquid (Solution or Compressed gas). |

Annex to the Safety Data Sheet
Exposure scenario 4: Industrial use

Concentration of substance in product Covers percentage substance in the product up to 100 % (unless stated differently).

Amounts used Region: 25000 t/y
 Total: 354631 t/y

Working area Indoor/outdoor use.

Process Continuous process. Batch process.

System Handle substance within a closed system.

General measures Assumes a good basic standard of occupational hygiene is implemented.
 Workers must be trained in the proper use and handling of this product as required under applicable regulations.
 Wear protective gloves/protective clothing/eye protection/face protection, Boots, Helmet.

Contributing scenarios

| Control of environmental exposure | |
|--|--|
| Environmental Release Category | ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles ERC5 - Industrial use resulting in inclusion into or onto a matrix ERC6b - Industrial use of reactive processing aids ERC7 - Industrial use of substances in closed systems |
| Product characteristics | Liquid |
| Amounts used | Region 25000 t/y Total 354631 t/y |
| Frequency and duration of use | Continuous release |

| Control of worker exposure | |
|--|---|
| Process category | PROC1 - Use in closed process, no likelihood of exposure |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use Indoor use without local exhaust ventilation (LEV) |

| | |
|--|---|
| Process category | PROC2 - Use in closed, continuous process with occasional controlled exposure PROC3 - Use in closed batch process (synthesis or formulation) |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) Indoor use with local exhaust ventilation (LEV) |

| | |
|--|---|
| Process category | PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) |

| | |
|--|---|
| Process category | PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC13 - Treatment of articles by dipping and pouring |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) |

3. EXPOSURE ESTIMATION AND REFERENCE TO ITS SOURCE

Annex to the Safety Data Sheet
Exposure scenario 4: Industrial use

| Environment Exposure Estimation | |
|--|---|
| Environmental Release Category | ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles |
| Release to Air | 7.15 x 10 ⁴ kg/d |
| Release to Water | 7.52 x 10 ⁴ kg/d |
| Freshwater | PEC: 2.82 x 10 ⁻³ mg/L - Total Ammonia , 1.08 x 10 ⁻⁴ - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.098 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |
| Marine water | PEC: 6.06 x 10 ⁻⁴ mg/L - Total Ammonia , 2.31 x 10 ⁻⁵ - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.021 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |

| | |
|--------------------------------|---|
| Environmental Release Category | ERC5 - Industrial use resulting in inclusion into or onto a matrix |
| Release to Air | 3.76 x 10 ⁴ kg/d |
| Release to Water | 3.76 x 10 ⁴ kg/d |
| Freshwater | PEC: 1.46 x 10 ⁻³ mg/L - Total Ammonia , 5.58 x 10 ⁻⁵ - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.051 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |
| Marine water | PEC: 3.17 x 10 ⁻⁴ mg/L - Total Ammonia , 1.21 x 10 ⁻⁵ - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 0.011 Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |

| | |
|--------------------------------|---|
| Environmental Release Category | ERC6b - Industrial use of reactive processing aids |
| Release to Air | 75.2 kg/d |
| Release to Water | 3760 kg/d |
| Freshwater | PEC: 4.54 x 10 ⁻⁵ mg/L - Total Ammonia , 1.73 x 10 ⁻⁶ - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 1.58 x 10 ⁻³ Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |
| Marine water | PEC: 5.19 x 10 ⁻⁶ mg/L - Total Ammonia , 1.98 x 10 ⁻⁷ - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 1.80 x 10 ⁻⁴ Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |

| | |
|--------------------------------|---|
| Environmental Release Category | ERC7 - Industrial use of substances in closed systems |
| Release to Air | 3760 kg/d |
| Release to Water | 3760 kg/d |
| Freshwater | PEC: 1.46 x 10 ⁻⁴ mg/L - Total Ammonia , 5.58 x 10 ⁻⁶ - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 5.07 x 10 ⁻³ Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |
| Marine water | PEC: 3.17 x 10 ⁻⁵ mg/L - Total Ammonia , 1.21 x 10 ⁻⁶ - Free Ammonia PNEC: 0.0011 mg/L - Free Ammonia RCR: 1.10 x 10 ⁻³ Discussion Conversion from Total Ammonia to Free Ammonia based on a fraction of 3.82%, given for pH 8 and 25 °C (Ref data in EPA document EPA-600/3-79-091) |

| Health Exposure Estimation | |
|-----------------------------------|--|
| Process category | PROC1 - Use in closed process, no likelihood of exposure |

Annex to the Safety Data Sheet
Exposure scenario 4: Industrial use

| | |
|---|---|
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use <0.01 mg/m ³ , RCR: <0.01 - Respiratory Protection No Indoor use without local exhaust ventilation (LEV) 0.01 mg/m ³ , RCR: <0.01 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use / Indoor use without local exhaust ventilation (LEV) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves |
| Process category | PROC2 - Use in closed, continuous process with occasional controlled exposure |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.24 mg/m ³ , RCR 0.09 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.54 mg/m ³ , RCR: 0.25 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.37 mg/kg bw/d, RCR: 0.20 - No gloves Indoor use with local exhaust ventilation (LEV) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves |
| Process category | PROC3 - Use in closed batch process (synthesis or formulation) |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 2.48 mg/m ³ , RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m ³ , RCR: 0.51 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves Indoor use with local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves |
| Process category | PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 2.48 mg/m ³ , RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m ³ , RCR: 0.51 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |
| Process category | PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m ³ , RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m ³ , RCR: 0.06 - Respiratory Protection Reduction 95% |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.07 mg/kg bw/d, RCR: 0.01 - No gloves |
| Process category | PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |

Annex to the Safety Data Sheet
Exposure scenario 4: Industrial use

| | |
|---|---|
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 3.72 mg/m ³ , RCR: 0.27 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.19 mg/m ³ , RCR: 0.23 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |
| Process category | PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 4.96 mg/m ³ , RCR: 0.35 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.71 mg/m ³ , RCR: 0.05 - Respiratory Protection 95% |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |
| Process category | PROC13 - Treatment of articles by dipping and pouring |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m ³ , RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m ³ , RCR: 0.06 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |

4. GUIDANCE TO DOWNSTREAM USER FOR EVALUATING EMPLOYEE WHETHER HE WORKS INSIDE THE BOUNDARIES SET BY THE ES

Environmental exposure

Used EUSES model: EUSUS v2.1.

Non-standard assumptions: Required removal efficiency (wastewater) 100%.

Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.

Predicted No Effect Concentration (PNEC): Water, 0.0011 mg/L (Free Ammonia). No other PNEC's derived.

Control of worker exposure

The ECETOC TRA tool has been used to estimate consumer exposures unless otherwise indicated.

Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.

Used Derived No Effect Level (DNEL):

Worker - inhalative, long-term - local,

Worker - dermal, short-term - systemic,

Worker - dermal, long-term - systemic.

Other DNEL's were not critical.

Guidance to check compliance with the exposure scenario

Annex to the Safety Data Sheet
Exposure scenario 4: Industrial use

If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

For scaling see: ECETOC TRA, ART, STOFFENMANAGER, EUSES.

Further information on the assumptions contained in this exposure scenario can be found at: Website Model, ECETOC TRA and RIVM report 601450009, "Emission scenario document for biocides", 2001.

Workplace measurements:

Refer to European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) or equivalent national standard(s).

Refer to European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) or equivalent national standard(s).

Refer to European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) or equivalent national standard(s).

BOHS/NVVA guidance "Testing Compliance with Occupational Exposure Limits for Airborne Substances".

Workplace measurements - Method: <http://amcaw.ifa.dguv.de/substance/methoden/096-L-Ammonia.pdf>.

1. EXPOSURE SCENARIO

| | |
|---------------------------------------|--|
| Exposure scenario Title | 5 Professional use |
| Use descriptors | |
| Sector of use | SU1 - Agriculture, forestry, fishery SU4 - Manufacture of food products SU5 - Manufacture of textiles, leather, fur SU6a - Manufacture of wood and wood products SU6b - Manufacture of pulp, paper and paper products SU8 - Manufacture of bulk, large scale chemicals (including petroleum products) SU9 - Manufacture of fine chemicals SU10 - Formulation [mixing] of preparations and/or re-packaging SU11 - Manufacture of rubber products SU12 - Manufacture of plastics products, including compounding and conversion SU15 - Manufacture of fabricated metal products, except machinery and equipment SU16 - Manufacture of computer, electronic and optical products, electrical equipment SU23 - Recycling SU24 - Scientific research and development SU0 - Other |
| Product category | PC9a - Coatings and paints, thinners, paint removers PC12 - Fertilisers PC14 - Metal surface treatment products, including galvanic and electroplating products PC15 - Non-metal-surface treatment products PC16 - Heat transfer fluids PC19 - Intermediates PC20 - Products such as pH-regulators, flocculants, precipitants, neutralization agents, other unspecified PC21 - Laboratory chemicals PC29 - Pharmaceuticals PC30 - Photochemicals PC37 - Water treatment chemicals PC40 - Extraction agents |
| Process categories | PROC1 - Use in closed process, no likelihood of exposure PROC2 - Use in closed, continuous process with occasional controlled exposure (e.g. sampling) PROC3 - Use in closed batch process (synthesis or formulation); Industrial setting PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC8a - Transfer of substance or mixture (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC 8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9 - Transfer of substance or mixture into small containers (dedicated filling line, including weighing) PROC13 - Treatment of articles by dipping and pouring PROC15 - Use as laboratory reagent PROC20 - Heat and pressure transfer fluids in dispersive use but closed systems |
| Environmental Release Category | ERC8b - Wide dispersive indoor use of reactive substances in open systems ERC8e - Wide dispersive outdoor use of reactive substances in open systems ERC8f - Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC9a - Wide dispersive indoor use of substances in closed systems ERC9b - Wide dispersive outdoor use of substances in closed systems |

2. CONDITIONS OF USE AFFECTING EXPOSURE

Product characteristics

Annex to the Safety Data Sheet
Exposure scenario 5: Professional use

Physical state @20°C Liquid (Solution or Compressed gas).
Concentration of substance in product Covers percentage substance in the product up to 100 % (unless stated differently).

Working area Indoor/outdoor use.
Process Continuous process. Batch process.
System Handle substance within a closed system.
General measures Assumes a good basic standard of occupational hygiene is implemented.
 Workers must be trained in the proper use and handling of this product as required under applicable regulations.
 Wear protective gloves/protective clothing/eye protection/face protection, Boots, Helmet.

Contributing scenarios

| Control of environmental exposure | |
|--|--|
| Environmental Release Category | ERC8b - Wide dispersive indoor use of reactive substances in open systems ERC8e - Wide dispersive outdoor use of reactive substances in open systems ERC8f - Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC9a - Wide dispersive indoor use of substances in closed systems ERC9b - Wide dispersive outdoor use of substances in closed systems |
| Frequency and duration of use | No significant effect |

| Control of worker exposure | |
|--|---|
| Process category | PROC1 - Use in closed process, no likelihood of exposure |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use Indoor use without local exhaust ventilation (LEV) |

| | |
|--|--|
| Process category | PROC2 - Use in closed, continuous process with occasional controlled exposure PROC3 - Use in closed batch process (synthesis or formulation) PROC20 - Heat and pressure transfer fluids in dispersive, professional use but closed systems |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) Indoor use with local exhaust ventilation (LEV) |

| | |
|--|---|
| Process category | PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) |

| | |
|--|--|
| Process category | PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC13 - Treatment of articles by dipping and pouring |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Outdoor use with respiratory protection equipment (RPE) and gloves Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) |

| | |
|--|---|
| Process category | PROC15 - Use as laboratory reagent |
| Frequency and duration of use | >4 h |
| Technical conditions and measures to control dispersion from source towards the worker | Indoor use with local exhaust ventilation (LEV) |

3. EXPOSURE ESTIMATION AND REFERENCE TO ITS SOURCE

Health Exposure Estimation

| | |
|---|---|
| Process category | PROC1 - Use in closed process, no likelihood of exposure |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use <0.01 mg/m ³ , RCR: <0.01 - Respiratory Protection No Indoor use without local exhaust ventilation (LEV) 0.01 mg/m ³ , RCR: <0.01 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use / Indoor use without local exhaust ventilation (LEV) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves |

| | |
|---|---|
| Process category | PROC2 - Use in closed, continuous process with occasional controlled exposure |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.24 mg/m ³ , RCR 0.09 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 3.54 mg/m ³ , RCR: 0.25 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.37 mg/kg bw/d, RCR: 0.20 - No gloves Indoor use with local exhaust ventilation (LEV) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves |

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| Process category | PROC3 - Use in closed batch process (synthesis or formulation) |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 2.48 mg/m ³ , RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m ³ , RCR: 0.51 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 0.34 mg/kg bw/d, RCR: 0.05 - No gloves Indoor use with local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves |

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| Process category | PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 2.48 mg/m ³ , RCR: 0.18 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m ³ , RCR: 0.51 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |

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| Process category | PROC5 - Mixing or blending in batch processes for formulation of mixtures and articles (multi-stage and/or significant contact) |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m ³ , RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m ³ , RCR: 0.06 - Respiratory Protection Reduction 95% |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment |

Annex to the Safety Data Sheet
Exposure scenario 5: Professional use

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| | (RPE) 0.07 mg/kg bw/d, RCR: 0.01 - No gloves |
| Process category | PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m ³ , RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m ³ , RCR: 0.06 - Respiratory Protection Reduction 95% |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves |
| Process category | PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 3.72 mg/m ³ , RCR: 0.27 - Respiratory Protection 95% Indoor use with local exhaust ventilation (LEV) 3.19 mg/m ³ , RCR: 0.23 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |
| Process category | PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing) |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 4.96 mg/m ³ , RCR: 0.35 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.71 mg/m ³ , RCR: 0.05 - Respiratory Protection Reduction 95% |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 0.69 mg/kg bw/d, RCR: 0.10 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |
| Process category | PROC13 - Treatment of articles by dipping and pouring |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 6.20 mg/m ³ , RCR: 0.44 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.89 mg/m ³ , RCR: 0.06 - Respiratory Protection 95% |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) and gloves 1.37 mg/kg bw/d, RCR: 0.20 - Gloves Reduction 90% Indoor use with local exhaust ventilation (LEV) and respiratory protection equipment (RPE) 0.69 mg/kg bw/d, RCR: 0.10 - No gloves |
| Process category | PROC15 - Use as laboratory reagent |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Indoor use with local exhaust ventilation (LEV) 3.54 mg/m ³ , RCR: 0.25 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Indoor use without local exhaust ventilation (LEV) 0.03 mg/kg bw/d, RCR: 0.01 - No gloves |

Annex to the Safety Data Sheet
Exposure scenario 5: Professional use

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| Process category | PROC20 - Heat and pressure transfer fluids in dispersive, professional use but closed systems |
| Long-term exposure - Local effects - Inhalation | >4 h Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.24 mg/m ³ , RCR: 0.09 - Respiratory Protection Reduction 95% Indoor use with local exhaust ventilation (LEV) 7.08 mg/m ³ , RCR: 0.51 - Respiratory Protection No |
| Acute / short-term exposure - Systemic effects - Dermal | Exposure concentrations Outdoor use with respiratory protection equipment (RPE) 1.71 mg/kg bw/d, RCR: 0.25 - No gloves Indoor use with local exhaust ventilation (LEV) 0.14 mg/kg bw/d, RCR: 0.02 - No gloves |

4. GUIDANCE TO DOWNSTREAM USER FOR EVALUATING EMPLOYEE WHETHER HE WORKS INSIDE THE BOUNDARIES SET BY THE ES

Environmental exposure

Used EUSES model: EUSUS v2.1.
Non-standard assumptions: Required removal efficiency (wastewater) 100%.
Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
Predicted No Effect Concentration (PNEC): Water, 0.0011 mg/L (Free Ammonia). No other PNEC's derived.

Control of worker exposure

The ECETOC TRA tool has been used to estimate consumer exposures unless otherwise indicated.
Risk assessment: Based on Risk Characterisation Ratio (RCR), Calculation method.
Used Derived No Effect Level (DNEL):
Worker - inhalative, long-term - local,
Worker - dermal, short-term - systemic,
Worker - dermal, long-term - systemic.
Other DNEL's were not critical.

Guidance to check compliance with the exposure scenario

If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

For scaling see: ECETOC TRA, ART, STOFFENMANAGER, EUSES.

Further information on the assumptions contained in this exposure scenario can be found at: Website Model, ECETOC TRA and RIVM report 601450009, "Emission scenario document for biocides", 2001.

Workplace measurements:

Refer to European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) or equivalent national standard(s).
Refer to European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) or equivalent national standard(s).
Refer to European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) or equivalent national standard(s).
BOHS/NVVA guidance "Testing Compliance with Occupational Exposure Limits for Airborne Substances".
Workplace measurements - Method: <http://amcaw.ifa.dguv.de/substance/methoden/096-L-Ammonia.pdf>.