



SAFETY DATA SHEET

UVASORB HA10

Revision Number 2.0
Revision Date 07/27/2015
Print Date 07/27/2015

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifier

Product Name : UVASORB HA10

1.2 Recommended use(s) and restrictions

Product use : Light stabilizer – manufacture of substances

Restrictions of use : No known restrictions

1.3 Manufacturer / Supplier

Company Information : 3V INC.
888 Woodstock Street
Georgetown, South Carolina 29440
USA

Telephone : (843) 546-8556

Fax : (843) 546-0007

E-mail address - responsible person : product.safety@3Vusa.com
for safety data sheets.

1.4 Emergency Telephone Number

24 Hour Emergency Information : CHEMTREC - 1-800-424-9300

2. HAZARD(S) IDENTIFICATION

2.1 Classification of the substance or Mixture

2.2 GHS Classification in accordance with 29 CFR 1910.1200 (OSHA HCS)

Skin sensitization (Category 1), H317

Aquatic Chronic (Category 2), H411

2.3 GHS Label elements, including Precautionary Statements

Pictograms :



2.4 Signal word :

Warning



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2. HAZARD(S) IDENTIFICATION (continued)

Hazard Statements

- H317 : May cause an allergic skin reaction.
H411 : Toxic to aquatic life with long lasting effects.

Precautionary Statements

- P273 : Avoid release to the environment.
P280 : Wear protective gloves/protective clothing/eye and face protection.
P302+P352 : IF ON SKIN: Wash with plenty of soap and water.
P333+P313 : If skin irritation or rash occurs: Get medical advice/attention.

- Other Hazards : None

3. COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substance / Mixture

<u>Chemical components</u>	<u>CAS Number</u>	<u>Concentration</u>
1,3-Propanediamine,N,N"-1,2-ethanediylbis-, polymer with 2,4,6-trichloro-1,3,5-triazine, reaction products with N-butyl-2,2,6,6-tetramethyl-4-piperidinamine	: 136504-96-6	100%

4. FIRST AID MEASURES

4.1 Description of First Aid Measures

- Inhalation : If breathing becomes difficult, move the victim to fresh air and give oxygen. If breathing has ceased, administer artificial respiration. Seek immediate medical attention.
- Skin : Remove contaminated clothing and segregate. Wash the affected areas thoroughly with soap and water. Seek medical attention if irritation develops/persists. Wash contaminated clothing before reusing.
- Eye Exposure : Irrigate with water for at least 15 minutes. Seek medical attention.
- Ingestion : Rinse mouth with water. Do not induce vomiting unless advised to do so by a physician. Seek immediate medical attention. Never give anything by mouth to an unconscious person.

- 4.2 Most important symptoms and effects, both acute and delayed** : For symptoms and effects caused by the contained substances, please refer to sections 2 and 11.

- 4.3 Indication of immediate medical attention and special treatment needed** : Follow doctor's orders



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5. FIRE-FIGHTING MEASURES

5.1 Extinguishing Media

Suitable Extinguishing Media : Carbon dioxide, Dry chemical, Foam and Water spray
Unsuitable Extinguishing Media : None in particular

5.2 Special hazards arising from the Substance / mixture

: Do not breathe combustion products (carbon oxide, toxic pyrolysis products, etc).

5.3 Advice for fire-fighters

Protective Equipment : Wear full protective fire gear including SCBA operated in the positive pressure mode when the potential for exposure to chemicals of combustion exists.

Precautions for fire-fighters : Use water spray to cool unopened containers to prevent product decomposition and the development of substances potentially hazardous for health. Dispose of contaminated water used to extinguish fire in accordance with regulations.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal Precautions, Protective Equipment and Emergency Procedures

: If the permitted workplace exposure thresholds do not meet specifications, suitable respiratory protection must be worn.

6.2 Environmental Precautions

: Product must not penetrate storm drains, sewers, surface water, ground water or neighboring areas.

6.3 Methods and Materials for containment and clean-up :

: Sweep or shovel material without the formation of dust. Collect material in a suitable container with closed lid for disposal. Dispose in accordance with federal, state and local waste management regulations.

7. HANDLING AND STORAGE

7.1 Precautions for Safe Handling

: Avoid contact with eyes, skin and mucous membranes. Avoid inhalation of product dust. Do not ingest. Product is combustible and can form an explosive dust-air mixture. Avoid potential sources of ignition and take precautionary measures to avoid static discharges.

7.2 Conditions for Safe Storage

: Store product in original containers with proper labeling. Container lid should be tightly sealed when is not being used. Store product in a dry, cool and well ventilated area. Protect from light.

7.3 Incompatibilities

: No known incompatibilities under normal use and proper storage conditions.

7.4 Specific end use(s)

: No other specific uses are stipulated.



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8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control Parameters

Components with control parameters : TLV not established.
Industry standards recommend not exceeding 5 mg/m³.

DNELs for workers

Long-term systemic effects (Dermal) : 0.16 mg/kg bw/day.
Long-term systemic effects (Inhalation) : 0.56 mg/m³.

DNELs for general population

Long-term local effects (Inhalation) : 0.14 mg/m³.

PNEC water

PNEC fresh water : 1.2 µg/L.
PNEC marine water : 0.12 µg/L.

PNEC sediment

PNEC fresh water : 8 µg /kg sediment dw
PNEC marine water : 0.8 µg /kg sediment dw

PNEC oral (secondary poisoning) : 5 mg/kg food

PNEC soil : 5.9 mg/kg soil dw

PNEC for sewage treatment plant : STP - 100 mg/L

8.2 Engineering Controls

Control Measures : Ensure proper exhaust ventilation is equipped in working areas.

8.3 Personal Protective Equipment

Eye Protection : Chemical splash goggles or a full face respirator mask.

Skin Protection : Standard full length work apparel, TYVEK type coveralls and professional safety footwear.

Hand Protection : Chemical-protective gloves (PVC or PVC with nitrile).

Respiratory Protection : Organic vapor mask with dust filter, or supplied air depending upon airborne exposure levels.

8.4 Protective Equipment : Eye wash/safety shower located within 25 feet of working area.

*Please refer to the Exposure Scenario (pages 9-21) for the identified use contained in the Annex.
The implementation of RMMs should ensure that the likelihood of an event occurring due to the hazards associated with UVASORB HA10 are negligible and the risk is considered to be controlled to a level of no concern.*



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9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Basic physical and chemical properties

Appearance	: Granules, Powder or free flowing flakes
Color	: White to pale yellow
Odor	: Characteristic
Odor Threshold	: Not available
pH (1% in water)	: Not available
Melting Point	: > 120 °C
Boiling Point	: Not applicable
Distillation Range	: Not available
Flash Point	: Not applicable
Evaporation Rate	: Not available
Flammability of solids and gases	: Not available
Lower Explosive Limit	: Not available
Upper Explosive Limit	: Not available
Vapor Pressure	: Not available
Vapor Density	: Not available
Specific gravity	: 1,076 Kg/l
Solubility	: Insoluble in water
Partition coefficient: n-octanol / water	: Not available
Ignition temperature	: > 300 °C
Decomposition temperature	: Not available
Viscosity	: Not available
Reactive Properties	: Not available
<i>Dust explosion limits</i>	: <i>Lower limit 25-30 g/m3</i>

10. STABILITY AND REACTIVITY

10.1 Reactivity	: No particular risks of reaction with other under normal conditions
10.2 Chemical Stability	: Stable under recommended storage conditions.
10.3 Possibility of Hazardous Reactions	: No foreseeable hazardous reactions under normal conditions.
10.4 Conditions to Avoid	: None with proper storage and handling.
10.5 Incompatible Materials	: Information not available.
10.6 Hazardous Decomposition Products	: In the event of thermal decomposition or fire, potentially hazardous vapors may be released.

11. TOXICOLOGICAL INFORMATION

11.1 Acute Toxicity

LD50 (oral/rat)	: > 3200 mg/kg
Skin Irritation (rabbit)	: No Irritating (concentration 0.5 g).
Eye Irritation (rabbit)	: Irritant (concentration 0.1 g).

The undiluted substance caused moderate ocular effects in the treated animals; all effects cleared completely at (7) days after treatment.



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11. TOXICOLOGICAL INFORMATION (continued)

- Ames Test : Negative
- Respiratory or skin sensitization : Local Lymph Node Assay demonstrated that UVASORB HA10 has the potential to cause skin sensitization (OECD 429/EU Method B.42)
- Chronic Effects : This product is not considered a carcinogen.

Reproductive Toxicity:

Studies of a reproductive/developmental toxicity were not carried out with UVASORB HA10. However, the substance is expected to have a low absorption and therefore it is unlikely it can reach the target organs and induce toxicity. Moreover, no effects on reproductive organs have been observed in the 90-day repeated toxicity study.

Repeated Dose Toxicity:

The dietary administration of UVASORB HA10 for 13 weeks to rats did not cause any changes nasopharynx, lungs, mediastinal lymph nodes, liver and mesenteric lymph nodes. The NOAEL for this study was set at 24 mg/kg bw/day (FDA guideline for testing food additives, 1982).

11.2 Toxicological Effects:

Upon contact with skin, this product causes sensitization (dermatitis). Dermatitis derives from skin irritation on the areas which repeatedly come into contact with the sensitizing agent.

12. ECOLOGICAL INFORMATION

This product is dangerous for the environment and is toxic for aquatic organisms. In the long term, it may even have negative effects on aquatic environments.

12.1 Toxicity

- EC50/LC50 (Aquatic microorganisms/3h) : 1000 mg/l / (3h)
LC50 (Zebrafish/96h) : > 119 mg/l
IC50 (Algae/72h) : 1.2 mg/l
EC50 (Daphnia Magna/48h) : 7.3 mg/l

12.2 Persistence and Degradability : Biodegradability < 10% (OECD 301B)

12.3 Bio-accumulative potential : The substance is not expected to bioaccumulate in aquatic organisms, on the basis of a predicted BCF value lower than 56.

12.4 Mobility in Soil : UVASORB HA10 is expected to have moderate mobility in soil, based on the value of the predicted absorption / desorption coefficient (Koc) of 271 (l/kg), and therefore it is not expected to accumulate in soil.

12.5 Results of PBT and vPvB Assessment : Substance not classified as PBT nor vPvB. However, this material is expected to be toxic for aquatic organisms (algae).

12.6 Other Adverse Effects : Substance is expected to be toxic for aquatic organisms (algae). This product is dangerous for the environment and highly toxic for aquatic organisms. An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.



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13. DISPOSAL CONSIDERATIONS

13.1 Waste Treatment Methods

The hazard waste contained in this product should be evaluated in accordance with applicable regulations. Disposal must be performed through an authorized waste management firm, in compliance with national and local regulations. Contact the nearest EPA office for guidance if necessary.

14. TRANSPORT INFORMATION

US DOT
UN Number : 3077
Class : 9
Packing Group : III
Proper Shipping Name : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, NOS
(1,3-Propanediamine, N,N"-1,2-ethanediylbis-, polymer with 2,4,6-trichloro-1,3,5-triazine, reaction products with N-butyl-2,2,6,6-tetramethyl-4-piperidinamine)

IMDG
UN Number : 3077
Class : 9
Packing Group : III
Marine Pollutant : Yes
Proper Shipping Name : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, NOS
(1,3-Propanediamine, N,N"-1,2-ethanediylbis-, polymer with 2,4,6-trichloro-1,3,5-triazine, reaction products with N-butyl-2,2,6,6-tetramethyl-4-piperidinamine)

IATA
UN Number : 3077
Class : 9
Packing Group : III
Proper Shipping Name : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, NOS
(1,3-Propanediamine, N,N"-1,2-ethanediylbis-, polymer with 2,4,6-trichloro-1,3,5-triazine, reaction products with N-butyl-2,2,6,6-tetramethyl-4-piperidinamine)

15. REGULATORY INFORMATION

Global Chemical Inventories

All of the components comprised in this product are listed on the following inventories.

US (TSCA)
EU (REACH)
Canada (NDSL)
Japan (ENCS)
Korea (ECL)
Taiwan (NECI)

State Regulations

California Proposition 65 : Not listed

U.S. Federal Regulations

CERCLA RQ (lbs.) : Not Listed



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16. OTHER INFORMATION

NFPA Rating

Health Hazard : (2)
Fire Hazard : (2)
Reactivity Hazard : (0)

Significant New Use Rule (SNUR) : Reference 40 CFR 721.7280

Text of Hazard (H) Indicators referenced in sections 2 and 3

Skin Sensitizer : Category 1
Aquatic, Chronic Toxicity : Category 2
H317 : May cause an allergic skin reaction.
H411 : Toxic to aquatic life with long lasting effects.

“FOR CHEMICAL EMERGENCY”

Call CHEMTREC

24 Hour Emergency Response Information

1-800-424-9300

The statements made herein are intended to provide product safety information. This safety data sheet has been prepared with information currently available. Although care has been taken to provide accurate information, no warranties either expressed or implied are being made as a result of this information.



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Annex to UVASORB HA10
Safety Data Sheet

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Exposure Scenario 1: Plastics processing (compounding and conversion)

Processes, tasks, activities covered:

The microsphere of Uvasorb HA10, or its masterbatches, and others various types of additives are mixed with polymer granules or powder (mainly polyolefins) and converted into finished articles.

The additives can be incorporated into the polymers through several processes, which may be classed as closed, partially-open or open processes. Closed processes (i.e. extrusion, injection moulding) predominate in the plastic industry, partially-open processes are the next important (i.e. film extrusion, extrusion coating). Process temperature depends on the polymer (typically from 120 °C to 250 °C). The final products may contain up to 1.2% w/w of Uvasorb HA10.

The exposure scenario covers the use in polymers production plants, in compounders plants and in masterbatch producers plants, the use by converters, including exposures during materials transfer from bulk and semi-bulk and other manual application tasks, and exposures during the processing step and cleaning/maintenance activities.

2.1. Exposure scenario

Use descriptors:

Sector of use:

SU0: Other (SU3: Industrial uses - Use of substances as such or in mixtures); SU12: Manufacture of plastics products, including compounding and conversion)

Market sector:

Polymer preparations and compounds (PC32)

Article categories:

Plastic articles (AC13)

Environment:

Formulation in materials (ERC3)

2.1.1 Control of environmental exposure: *Formulation in materials (ERC3)*

Product characteristics

Physical state of the substance when used: solid (microspheres)
 Concentration of the substance in the mixtures: typically 20% and maximum 70% in masterbatches; maximum 1.2% in finished polymer compounds.

Amount used

Annual amount used at the main site of use: up to 250 ton/y (EUSES default value for the fraction of the main local source at formulation step: 0.4)

Frequency and duration of use

Production days per site: up to 250 day/y.

Environment factors not influenced by risk management

Receiving river flow rate $\geq 18000 \text{ m}^3/\text{day}$ (default value for the standard town).

Other given operational conditions affecting environmental exposure

Process conditions: T=120 °C to 250 °C; P= atmospheric pressure.

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

Closed processes should be used to reduce emissions.

Abatement techniques for dusts should be used (i.e. with wet scrubbers; efficiency of wet scrubbers for dusts (RMM library code: E 12.01): 50% (default value); 99%(max achievable); or by filtration; efficiency for filtration (RMMs library code: E12.03): 99.9% (max achievable)).

Abatement or control technology should be used to prevent losses to water (efficiency: > 90%), e.g., no release to sinks; closed water cycles for cooling water in contact with polymer; no discharge into sewer when renewed.

Solid wastes should be collected and sent to disposal (landfill or incinerator) or recycled.

Organizational measures to prevent/limit release from site

An environmental management system should be implemented.

Conditions and measures related to municipal sewage treatment plant

After on-site treatment, wastewaters are released to the external municipal sewage treatment plant: the size of municipal STP is 2000 m³/d (default size).

2.1.2 Control of environmental exposure: *Use in closed, continuous process with occasional controlled exposure (PROC2)*

Activities covered in the contributing exposure scenario:

Covers plastic processing in closed systems.

Product characteristics:

Physical state of the substance when used: solid (microspheres)
 Concentration of the substance in the mixtures: typically 20% and maximum 70% in master batches; maximum 1.2% in finished polymer compounds.



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Amount used

700 g/kg of master batch; up to 12 g/kg of final product

Frequency and duration of exposure:

Production days per site: up to 250 day/y.

For workers exposure assessment, a duration of exposure 1-4 hr/day was considered.

Human factor not influenced by risk management:

Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: two hands face (480 cm²)).

Other given operational conditions affecting workers exposure:

Process conditions: T=120 °C to 250 °C; P= atmospheric pressure.

Technical conditions and measures to control dispersion from source towards the workers:

Closed processes to reduce exposure.

Local exhaust ventilation should be present. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

Organizational measures to prevent/limit releases, dispersion and exposure:

Regular training of workers and consequent supervision should be provided.

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

Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes. Good hygiene practices and housekeeping are adopted.

2.1.3 Control of environmental exposure: Processes for formulation of preparations and articles (PROC 5)**Activities covered in the contributing exposure scenario:**

Formulation operations.

Product characteristics:

Physical state of the substance when used: solid (microspheres)

Concentration of the substance in the mixtures: typically 20% and 70% maximum in masterbatches; maximum 1.2% in finished polymer compounds.

Amount used

700 g/kg of masterbatch; up to 12 g/kg of final product

Frequency and duration of exposure:

Production days per site: up to 250 day/y.

For workers exposure assessment, a duration of exposure 1-4 hr/day was considered.

Human factor not influenced by risk management:

Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: two hands face (480 cm²)).

Other given operational conditions affecting workers exposure:

Process conditions: T=120 °C to 250 °C; P= atmospheric pressure.

Technical conditions and measures to control dispersion from source towards the workers:

Closed processes should be used to reduce exposure.

Local exhaust ventilation should be present. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

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

Regular training of workers and consequent supervision should be provided.

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

Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes and half-mask respirator, if engineering controls are not sufficient. Good hygiene practices and housekeeping are adopted.

2.1.4 Control of environmental exposure: Production of preparations or articles by tableting, compression, extrusion, pelettisation (PROC14)**Activities covered in the contributing exposure scenario:**

Production of preparations or articles.

Product characteristics:

Physical state of the substance when used: solid (microspheres)

Concentration of the substance in the mixtures: typically 20% and 70% maximum in masterbatches; maximum 1.2% in finished polymer compounds.

Amount used

700 g/kg of masterbatch; up to 12 g/kg of final product

Frequency and duration of exposure:

Production days per site: up to 250 day/y.

For workers exposure assessment, a duration of exposure 1- 4 hr/day was considered.



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Human factor not influenced by risk management:

Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: two hands face (480 cm²)).

Other given operational conditions affecting workers exposure:

Process conditions: T=120 °C to 250 °C; P= atmospheric pressure.

Technical conditions and measures to control dispersion from source towards the workers:

Closed processes should be used to reduce exposure.

Local exhaust ventilation should be present. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

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

Regular training of workers and consequent supervision should be provided.

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

Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes and half-mask respirator, if engineering controls are not sufficient. Good hygiene practices and housekeeping are adopted.

2.1.5 Control of workers exposure: *Transfer operations with dedicated equipment (PROC8b)*

Activities covered in the contributing exposure scenario: loading/unloading operations

Product characteristics:

Physical state of the substance when handled: solid (as microspheres; or included into a polymer matrix in masterbatches).

Concentration of substance in the mixture: up to 1.2 % w/w in the final products; 70% max w/w in masterbatches.

Frequency and duration of exposure:

For workers exposure assessment, a duration of exposure up to 4 hr/day was considered.

Human factor not influenced by risk management:

Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: two hands (480 cm²)).

Other given operational conditions affecting workers exposure:

Operational conditions: T= ambient temperature.

Technical conditions and measures to control dispersion from source towards the workers:

Local exhaust ventilation should be used . Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 95%.

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

Regular training of workers and consequent supervision should be provided.

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

Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes and half-mask respirator, if engineering controls are not sufficient. Good hygiene practices and housekeeping are adopted.

2.1.6 Control of workers exposure: *Transfer operations into small containers (PROC9)*

Activities covered in the contributing exposure scenario: loading/unloading operations into small containers

Product characteristics:

Physical state of the substance when handled: solid (as microspheres; or included into a polymer matrix in masterbatches).

Concentration of substance in the mixture: up to 1.2 % w/w in the final products; 70% w/w in masterbatches.

Frequency and duration of exposure:

For workers exposure assessment, a duration of exposure up to 4 hr/day was considered.

Human factor not influenced by risk management:

Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: two hands (480 cm²)).

Other given operational conditions affecting workers exposure:

Operational conditions: T= ambient temperature.

Technical conditions and measures to control dispersion from source towards the workers:

Local exhaust ventilation should be used . Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

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

Regular training of workers and consequent supervision should be provided.

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

Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes and half-mask respirator, if engineering controls are not sufficient. Good hygiene practices and housekeeping are adopted.



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2.2 Exposure estimation and reference to its sources

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, resulting risk characterization ratios (estimated exposure/DNEL) are expected to be less than 1.

Workers exposure have been estimated using ECETOC TRA v2 and RISKOFDERM.

2.2.a. Environmental exposure

Compartments	Predicted exposure concentrations (PEC)	Risk Characterization Ratios
Freshwater	3.44×10^{-4}	4.19×10^{-1}
Freshwater sediment	3.36×10^{-3}	4.19×10^{-1}
Marine water	3.56×10^{-5}	4.33×10^{-1}
Marine water sediment	3.47×10^{-4}	4.33×10^{-1}
Predators in the freshwater food chain	9.67×10^{-3}	1.81×10^{-3}
Agricultural soil	4.11×10^{-3}	6.99×10^{-1}
Predators in the terrestrial food chain	3.87×10^{-3}	7.25×10^{-4}
Microorganism in STP	5.03×10^{-3}	5.03×10^{-4}

2.2.b. Worker exposure

Name of contributing scenario		Estimated exposure		RCR Risk characterization ratios	
		Inhalatory (mg/m ³)/8h workday	Dermal (mg/kg bw/day)	inhalation	dermal
PROC2	Use in closed, continuous process with occasional controlled exposure	6.00×10^{-4}	4.11×10^{-3}	1.07×10^{-3}	2.57×10^{-2}
PROC5	Processes for formulation of preparations and articles	3.00×10^{-2}	2.06×10^{-3}	5.36×10^{-2}	1.29×10^{-2}
PROC14	Production of preparations or articles by tableting, compression, extrusion, pelettisation	6.00×10^{-3}	1.03×10^{-2}	1.07×10^{-2}	6.43×10^{-2}
PROC8b	Transfer operations with dedicated equipment	3.00×10^{-3}	2.06×10^{-2}	5.36×10^{-3}	1.29×10^{-1}
PROC9	Transfer operations into small containers	6.00×10^{-3}	2.06×10^{-2}	1.07×10^{-2}	1.29×10^{-1}

Dermal local effects

Risk of damage : low

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

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, resulting risk characterization ratios (estimated exposure/DNEL or PNEC) are expected to be less than 1. Confirm that the adopted RMMs and OCs are as described or of equivalent efficiency. If they differ from those in the ES, check compliance with the ES. Scaling can be used to demonstrate compliance; it can be done with the exposure estimation tool used: ECETOC TRA tool (see information on website www.ecetoc.org) and EUSES.



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Exposure Scenario 2: Formulation of powder coatings

Processes, tasks, activities covered:

The microspheres of Uvasorb HA10 are mixed with the resin and the other ingredients (i.e. pigments, fillers, flow control agents and other additives) to manufacture powder coatings. The manufacturing technique mainly used is the melt-blend processing, including operations as: weighing of raw materials, pre-mixing of them into a homogeneous dry blend, melt mixing of the dry blend, cooling and flaking of the melt-mixed extrudate, grinding of the extrudate into powder, sieving and classification of the powder product. The exposure scenario covers the whole process of formulation of powder coatings.

3.1. Exposure scenario

Use descriptors:

Sector of use:

SU0: Other (SU3: Industrial uses; NACE code C20.3: Manufacture of paints, varnishes and coatings)

Market sector:

Coatings and paints (PC9a)

Environment:

Formulation of powder coatings (ERC2; CEPE SPERC 2.31.v.1)

Workers:

Mixing in closed batch processes for formulation (PROC3)
Mixing in batch processes for formulation (PROC5) Transfer operations with dedicated equipment (PROC8b) Transfer operations into small containers (PROC9)

3.1.1 Control of environmental exposure: Formulation of powder coatings (ERC2; CEPE SPERC 2.31.v.1)

Product characteristics

Physical state of the substance when used: solid (as microspheres). Concentration of substance in the final products: up to 0.8% w/w.

Amount used

Annual amount used at the main site of use: up to 4 ton/y (EUSES default value for the fraction of the main local source: 0.4)

Frequency and duration of use

Production days per site: up to 250 day/y.

Environment factors not influenced by risk management

Receiving river flow rate ≥ 18000 m³/day (default value for the standard town).

Other given operational conditions affecting environmental exposure

The process should be optimized for highly efficient utilisation of raw materials.

Process temperatures are above the softening point of the resins, generally between 90 °C to 120 °C; P= atmospheric pressure.

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

Risk management measures should be primarily aimed at controlling emissions of particulates at the most significant emission points to atmosphere from sources within the manufacturing process where airborne particulates can be created.

For example:

- delivering of particulate raw materials in bulk tankers and discharged to closed silos;
- delivering of particulate raw materials in closed packaging (IBCs, drums, boxes, sacks);
- use of closed transfers of particulates from storage to production equipment (e.g. metered piped or pumped additions);
- no extraction on closed production equipment, when adding and incorporating particulate raw materials;
- use of semi-closed production vessels with extraction to atmosphere to reduce workplace airborne particulate concentrations;
- use of cyclone and bag filters, connected to (often multiple) emission sources, to control emissions;
- storing of particulate wastes in closed containers.

The composition of products and the overall process should be such that there are no discharges of raw materials or products to wastewater or to soil from the manufacturing plant.

Efficiency for bag and cyclone filters are typically rated at 99% (RMMs library code: E12.03).

Efficiency for wastewater treatment by sedimentation of solids: 30% (default value); 100% (max achievable) (RMMs library code: E13.01).

Organisational measures to prevent/limit release from site

An environmental management system should be implemented.

Conditions and measures related to municipal sewage treatment plant

Wastewaters are released to the external municipal sewage treatment plant: the size of municipal STP is 2000 m³/d (default size).



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3.1.2 Control of worker exposure: *Mixing in closed batch processes for formulation (PROC3)*

Activities covered in the contributing exposure scenario:

The whole process of formulation of powder coatings in closed processes.

Product characteristics

Physical state of the substance when used: solid (as microspheres) Concentration of substance in the final products: up to 0.8% w/w.

Amount used

up to 8 kg for a 1000 kg batch;

Frequency and duration of exposure:

Production days per site: up to 250 day/y.
For workers exposure assessment, a duration of exposure > 4 hr/day was considered.

Human factor not influenced by risk management:

Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: one hand face only (240 cm²)).

Other given operational conditions affecting workers exposure:

The process should be optimized for highly efficient utilisation of raw materials and reduction of losses..
Process temperatures are above the softening point of the resins, generally between 90 °C to 120 °C; P = atmospheric pressure.

Technical conditions and measures to control dispersion from source towards the workers:

Process losses should be reduced to the absolute minimum, through use of general and manufacturing plant extraction to reduce workplace concentrations of airborne and particulates; and through use of closed or covered manufacturing equipment, wherever possible, to minimize losses.

Local exhaust ventilation should be present. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

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

Regular training of workers and consequent supervision should be provided.

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

Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes and half-mask respirator, if engineering controls are not sufficient. Good hygiene practices and housekeeping are adopted. (APF factor of respiratory protection assumed by ECETOC TRA Worker model: 10; Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20). Good hygiene practices and housekeeping are adopted.

3.1.3 Control of worker exposure: *Mixing in batch processes for formulation (PROC5)*

Activities covered in the contributing exposure scenario:

The whole process of formulation of powder coatings.

Product characteristics

Physical state of the substance when used: solid (as microspheres) Concentration of substance in the final products: up to 0.8% w/w.

Amount used

up to 8 kg for a 1000 kg batch;

Frequency and duration of exposure:

Production days per site: up to 250 day/y.
For workers exposure assessment, a duration of exposure > 4 hr/day was considered.

Human factor not influenced by risk management:

Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: two hands face (480 cm²)).

Other given operational conditions affecting workers exposure:

The process should be optimized for highly efficient utilisation of raw materials and reduction of losses..
Process temperatures are above the softening point of the resins, generally between 90 °C to 120 °C; P= atmospheric pressure.

Technical conditions and measures to control dispersion from source towards the workers:

Process losses should be reduced to the absolute minimum, through use of general and manufacturing plant extraction to reduce workplace concentrations of airborne and particulates. Local exhaust ventilation should be present. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

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

Regular training of workers and consequent supervision should be provided.



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

Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes and half-mask respirator, if engineering controls are not sufficient. Good hygiene practices and housekeeping are adopted. (APF factor of respiratory protection assumed by ECETOC TRA Worker model: 10; Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20). Good hygiene practices and housekeeping are adopted.

3.1.4 Control of workers exposure: *Transfer operations with dedicated equipment (PROC8b)*

Activities covered in the contributing exposure scenario: loading/unloading operations

Product characteristics

Physical state of the substance when used: solid (as microspheres or included into the polymer matrix). Concentration of substance in the final products: up to 0.8% w/w.

Frequency and duration of exposure:

For workers exposure assessment, a duration of exposure up to 4 hr/day was considered.

Human factor not influenced by risk management:

Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: two hands (480 cm²)).

Other given operational conditions affecting workers exposure:

Operational conditions: T = ambient temperature.

Technical conditions and measures to control dispersion from source towards the workers:

During transfer operations, losses should be reduced to the absolute minimum, through use of general and manufacturing plant extraction to reduce workplace concentrations of airborne and particulates.
Local exhaust ventilation should be used. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 95%.

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

Regular training of workers and consequent supervision should be provided.

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

Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes and half-mask respirator, if engineering controls are not sufficient. Good hygiene practices and housekeeping are adopted. (APF factor of respiratory protection assumed by ECETOC TRA Worker model: 10; Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20). Good hygiene practices and housekeeping are adopted.

3.1.5 Control of workers exposure: *Transfer operations into small containers (PROC9)*

Activities covered in the contributing exposure scenario: loading/unloading operations into small containers.

Product characteristics:

Physical state of the substance when used: solid (as microspheres or included into the polymer matrix). Concentration of substance in the final products: up to 0.8% w/w.

Frequency and duration of exposure:

For workers exposure assessment, a duration of exposure up to 4 hr/day was considered.

Human factor not influenced by risk management:

Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: two hands (480 cm²)).

Other given operational conditions affecting workers exposure: Operational conditions: T= ambient temperature.

Technical conditions and measures to control dispersion from source towards the workers:

During transfer operations, losses should be reduced to the absolute minimum, through use of general and manufacturing plant extraction to reduce workplace concentrations of airborne and particulates.
Local exhaust ventilation should be used. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

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

Regular training of workers and consequent supervision should be provided.

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

Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes and half-mask respirator, if engineering controls are not sufficient. Good hygiene practices and housekeeping are adopted. (APF factor of respiratory protection assumed by ECETOC TRA Worker model: 10; Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20). Good hygiene practices and housekeeping are adopted.



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3.2 Exposure estimation and reference to its sources

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, resulting risk characterization ratios (estimated exposure/DNEL) are expected to be less than 1.

Workers exposure have been estimated using ECETOC TRA v2 and RISKOFDERM.

3.2.a. Environmental exposure

Compartments	Predicted exposure concentrations (PEC)	Risk Characterization Ratios
Freshwater	2.66×10^{-4}	3.23×10^{-1}
Freshwater sediment	2.59×10^{-3}	3.23×10^{-1}
Marine water	2.75×10^{-5}	3.34×10^{-1}
Marine water sediment	2.68×10^{-4}	3.34×10^{-1}
Predators in the freshwater food chain	7.46×10^{-3}	1.40×10^{-3}
Agricultural soil	3.17×10^{-3}	5.39×10^{-1}
Predators in the terrestrial food chain	2.98×10^{-3}	5.59×10^{-4}
Microorganism in STP	3.88×10^{-3}	3.88×10^{-4}

3.2.b. Worker exposure

Name of contributing scenario		Estimated exposure		RCR Risk characterization ratios	
		Inhalatory (mg/m ³)/8h workday	Dermal (mg/kg bw/day)	inhalation	dermal
PROC3	Mixing in closed batch processes for formulation	1.00×10^{-2}	1.72×10^{-3}	1.79×10^{-2}	1.07×10^{-2}
PROC5	Mixing in batch processes for formulation	5.00×10^{-2}	3.43×10^{-3}	8.93×10^{-2}	2.14×10^{-2}
PROC8b	Transfer operations with dedicated equipment	3.00×10^{-3}	2.06×10^{-2}	5.36×10^{-3}	1.29×10^{-1}
PROC9	Transfer operations into small containers	6.00×10^{-3}	2.06×10^{-2}	1.07×10^{-2}	1.29×10^{-1}

Dermal local effects

Risk of damage : low

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

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, resulting risk characterization ratios (estimated exposure/DNEL or PNEC) are expected to be less than 1. Confirm that the adopted RMMs and OCs are as described or of equivalent efficiency. If they differ from those in the ES, check compliance with the ES. Scaling can be used to demonstrate compliance; it can be done with the exposure estimation tool used: ECETOC TRA tool (see information on website www.ecetoc.org) and EUSES.



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Exposure Scenario 3: Industrial application of powder coatings

Processes, tasks, activities covered:

Powder coating are mainly used for coating of metals. The most common way of applying the powder coating to metal objects is to spray the powder using an electrostatic gun. The gun imparts a negative electric charge to the powder, which is then sprayed towards the grounded object by mechanical or compressed air spraying. After the application on the surface, the coating is heated in order to fuse and/or cure it and complete the coating process. The exposure scenario covers the industrial application of coatings by spraying.

4.1. Exposure scenario

Use descriptors:

Sector of use:

SU0: Other (SU3: Industrial uses ; SU15: Manufacture of fabricated metal products; SU16: Manufacture of computer, electronic and optical products, electrical equipment; SU17: General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment; SU18: Manufacture of furniture; SU19: Building and construction work)

Market sector:

Coatings and paints (PC9a)

Article categories:

Vehicles (AC1)
Machinery, mechanical appliances, electrical/electronic articles (AC2)
Metal articles (AC7)
Wood articles (AC11)
Plastic articles (AC13)

Environment:

Industrial application of powder coatings (ERC5; CEPE SPERC 5.1a.v1)

4.1.1 Control of environmental exposure: Industrial application of powder coatings (ERC5; CEPE SPERC 5.1a.v.1)

Product characteristics

Physical state of the substance when used: solid (included into a polymer matrix) Concentration of substance in the mixture: up to 0.8% w/w.

Amount used

Annual amount used at the main site of use: up to 7.5 ton/y (EUSES default value for the fraction of the main local source: 0.75)

Frequency and duration of use

Production days per site: up to 250 day/y.

Environment factors not influenced by risk management

Receiving river flow rate $\geq 18000 \text{ m}^3/\text{day}$ (default value for the standard town).

Other given operational conditions affecting environmental exposure

The process should be optimized for highly efficient utilisation of raw materials.
Process conditions: ambient temperature during the application of coatings; under high temperatures during curing process.

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

Closed processes should be used to reduce emissions.
Abatement techniques for dusts should be used (i.e. by filtration; efficiency for filtration (RMMs library code: E12.03): 99.9% (max achievable)). Efficiency for bag and cyclone filters are typically rated at 99% (RMMs library code: E12.03).
Solid wastes should be collected and sent to disposal (landfill or incinerator) or recycled.

Organisational measures to prevent/limit release from site

An environmental management system should be implemented.

Conditions and measures related to municipal sewage treatment plant

Wastewaters are released to the external municipal sewage treatment plant: the size of municipal STP is $2000 \text{ m}^3/\text{d}$ (default size).

4.1.2 Control of workers exposure: Use in closed process, no likelihood of exposure (PROCI)

Activities covered in the contributing exposure scenario:

Application of coatings using closed system

Product characteristics:

Physical state of the substance when used: solid (included into a polymer matrix) Concentration of substance in the mixture: up to 0.8% w/w.

Frequency and duration of exposure:

Up to 8 hr/d

Human factor not influenced by risk management:

Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: one hand face only (240 cm^2)).

Other given operational conditions affecting workers exposure:

Process conditions: ambient temperature during the application of coatings; under high temperatures during curing process.



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Technical conditions and measures to control dispersion from source towards the workers:
Closed and automated system.

Organizational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision should be provided.

Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes. Good hygiene practices and housekeeping are adopted. (Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20). Good hygiene practices and housekeeping are adopted.

4.1.3 Control of workers exposure: Use in closed continuous process (with occasional controlled exposure) (PROC3)

Activities covered in the contributing exposure scenario:
Application of coatings using closed continuous system

Product characteristics:
Physical state of the substance when used: solid (included into a polymer matrix) Concentration of substance in the mixture: up to 0.8% w/w.

Frequency and duration of exposure:
Up to 8 hr/d

Human factor not influenced by risk management:
Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: one hand face only (240 cm²)).

Other given operational conditions affecting workers exposure:
Process conditions: ambient temperature during the application of coatings; under high temperatures during curing process.

Technical conditions and measures to control dispersion from source towards the workers:
Closed and automated system.
Local exhaust ventilation should be used. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

Organisational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision should be provided.

Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes. Good hygiene practices and housekeeping are adopted. (Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20). Good hygiene practices and housekeeping are adopted.

4.1.4 Control of workers exposure: Use in closed batch process (PROC4)

Activities covered in the contributing exposure scenario:
Application of coatings using closed batch system

Product characteristics:
Physical state of the substance when used: solid (included into a polymer matrix) Concentration of substance in the mixture: up to 0.8% w/w.

Frequency and duration of exposure:
Up to 8 hr/d

Human factor not influenced by risk management:
Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: two hands (480 cm²)).

Other given operational conditions affecting workers exposure:
Process conditions: ambient temperature during the application of coatings; under high temperatures during curing process.

Technical conditions and measures to control dispersion from source towards the workers:
Closed batch system.
Local exhaust ventilation should be used. Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 90%.

Organisational measures to prevent/limit releases, dispersion and exposure:
Regular training of workers and consequent supervision should be provided.

Conditions and measures related to personal protection, hygiene and health evaluation:
Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes and half-mask respirator, if engineering controls are not sufficient. Good hygiene practices and housekeeping are adopted. (APF factor of respiratory protection assumed by ECETOC TRA Worker model: 10; Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20). Good hygiene practices and housekeeping are adopted.

4.1.5 Control of workers exposure: Industrial spraying (PROC7)

Activities covered in the contributing exposure scenario:
Application of powder coatings by spraying.



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Product characteristics:

Physical state of the substance when used: solid (included into a polymer matrix) Concentration of substance in the mixture: up to 0.8% w/w.

Frequency and duration of exposure:

Up to 8 hr/d

Human factor not influenced by risk management:

Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: two hands and forearms (1500 cm²)).

Other given operational conditions affecting workers exposure:

Process conditions: ambient temperature

Technical conditions and measures to control dispersion from source towards the workers:

Local exhaust ventilation should be used . Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 95%.

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

Regular training of workers and consequent supervision should be provided.

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

Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes and half-mask. Good hygiene practices and housekeeping are adopted. (APF factor of respiratory protection assumed by ECETOC TRA Worker model: 10; Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20). Good hygiene practices and housekeeping are adopted.

4.1.7 Control of workers exposure: Transfer operations at dedicated facilities (PROC8b)

Activities covered in the contributing exposure scenario:

loadings and unloading operations.

Product characteristics:

Physical state of the substance when used: solid (included into a polymer matrix)
Concentration of substance in the mixture: up to 0.8% w/w.

Frequency and duration of exposure:

For workers exposure assessment, a duration of exposure up to 4 hr/day was considered.

Human factor not influenced by risk management:

Default ECETOC TRA Worker model values were used in calculation of workers exposure (body parts potentially exposed: two hands (480 cm²)).

Other given operational conditions affecting workers exposure:

Process conditions: ambient temperature

Technical conditions and measures to control dispersion from source towards the workers:

Local exhaust ventilation should be used . Efficiency of LEV (RMM library code: W17.Ex1): 80% (typical default value); 96% (maximum achievable); LEV efficiency assumed by ECETOC TRA Worker model: 95%.

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

Regular training of workers and consequent supervision should be provided.

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

Personal protective equipment should be used: protective gloves, goggles, coverall, safety shoes, dust mask (APF factor of respiratory protection assumed by ECETOC TRA Worker model: 10; Exposure reduction factor of gloves in combination with specific activity training assumed in the assessment: 20). Good hygiene practices and housekeeping are adopted.

4.2 Exposure estimation and reference to its sources

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, resulting risk characterization ratios (estimated exposure/DNEL) are expected to be less than 1.

Workers exposure have been estimated using ECETOC TRA v2 and RISKOFDERM.

4.2.a. Environmental exposure

Compartments	Predicted exposure concentrations (PEC)	Risk Characterization Ratios
Freshwater	5.58×10^{-7}	4.65×10^{-4}
Freshwater sediment	3.72×10^{-6}	4.65×10^{-4}
Marine water	5.41×10^{-8}	4.51×10^{-4}
Marine water sediment	3.61×10^{-7}	4.51×10^{-4}
Predators in the freshwater food chain	3.12×10^{-5}	5.86×10^{-6}
Agricultural soil	2.74×10^{-4}	4.66×10^{-2}



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Predators in the terrestrial food chain	2.67×10^{-4}	5.00×10^{-5}
Microorganism in STP	0	0

4.2.b. Worker exposure

Name of contributing scenario		Estimated exposure		RCR Risk characterization ratios	
		Inhalatory (mg/m ³)/8h workday	Dermal (mg/kg bw/day)	inhalation	dermal
PROC1	Use in closed process, no likelihood of exposure	1.00×10^{-2}	1.37×10^{-4}	1.79×10^{-2}	8.57×10^{-4}
PROC3	Use in closed continuous process (with occasional controlled exposure)	1.00×10^{-2}	1.37×10^{-5}	1.79×10^{-2}	8.58×10^{-5}
PROC4	Use in closed batch process	5.00×10^{-2}	2.74×10^{-4}	8.93×10^{-2}	1.71×10^{-3}
PROC7	Industrial spraying	3.00×10^{-3}	8.56×10^{-4}	8.93×10^{-3}	5.35×10^{-3}
PROC8b	Transfer operations at dedicated facilities	3.00×10^{-3}	1.65×10^{-4}	5.36×10^{-3}	1.06×10^{-3}
Dermal local effects		Risk of damage : low			

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

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, resulting risk characterization ratios (estimated exposure/DNEL or PNEC) are expected to be less than 1. Confirm that the adopted RMMs and OCs are as described or of equivalent efficiency. If they differ from those in the ES, check compliance with the ES. Scaling can be used to demonstrate compliance; it can be done with the exposure estimation tool used: ECETOC TRA tool (see information on website www.ecetoc.org) and EUSES.