Safety Data Sheet

according to Regulation (EC) 1907/2006 (REACH)

Revision date: 2019-02-14

Supercedes: 2019-01-09

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

1.1. Product identifier:

Product trade name:	Kalama* Benzaldehyde, Technical
Company product number:	BZALDTECH
REACH registration number:	01-2119455540-44-0007
Substance name:	Benzaldehyde
Substance identification number:	EC 202-860-4, INDEX 605-012-00-5
Other means of identification:	Benzoic aldehyde, Benzenecarbonal, Benzenecarboxaldehyde

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

Uses:	Flavor and fragrance ingredient/additive. Intermediate. See Annex for covered uses.
Uses advised against:	None identified

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

Manufacturer/Supplier:	Emerald Performance Materials, LLC 1499 SE Tech Center Place, Suite 300 Vancouver, WA 98683 United States Telephone: +1-360-954-7100 FAX: +1-360-954-7201
EU Only Representative:	Penman Consulting bvba Avenue des Arts 10 B-1210 Brussels Belgium Telephone: +32 (0) 2 305 0698 email: pcbvba09@penmanconsulting.com
For further information about this SDS:	Email: product.compliance@emeraldmaterials.com

1.4. Emergency telephone number:

ChemTel (24 hours): 1-800-255-3924 (USA); +1-813-248-0585 (outside USA); 1-300-954-583 (Australia); 000-800-100-4086 (India).

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture:

Product classification according to Regulation (EC) 1272/2008 (CLP) as amended:

Acute Toxicity, Oral, category 4 , H302
Skin Irritation, category 2, H315
Eye Irritation, category 2, H319
Acute Toxicity, Inhalation, category 4 , H332
STOT, single exposure, category 3, RTI , H335
Hazardous to the aquatic environment, Chronic, category 3, H412

2.2. Label elements:

Product labeling according to Regulation (EC) 1272/2008 (CLP) as amended:

Hazard pictogram(s):

Signal word:
Warning

Hazard statements:
H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H332 Harmful if inhaled.
H335 May cause respiratory irritation.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statements:
P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
P264 Wash skin thoroughly after handling.
P273 Avoid release to the environment.
P280 Wear protective gloves/eye protection/face protection.
P301+P312 IF SWALLOWED: Call a POISON CENTRE/doctor if you feel unwell.
P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312 Call a POISON CENTRE/doctor if you feel unwell.
P337+P313 If eye irritation persists: Get medical advice/attention.
P403+P233 Store in a well-ventilated place. Keep container tightly closed.

Supplemental information: No Additional Information

Precautionary statements are listed according to the United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS) - Annex III and ECHA Guidance on Labelling and Packaging. Regulations in individual countries/regions may determine which statements are required on the product label. See product label for specifics.

2.3. Other hazards:

PBT/vPvB criteria: This product does not meet the PBT and vPvB classification criteria.
Other hazards: BENZALDEHYDE: Combustible. Finely dispersed benzaldehyde may ignite spontaneously. May form peroxides in contact with air.

See Section 11 for toxicological information.

SECTION 3: Composition/information on ingredients

3.1. Substance:

CAS-No.	Chemical Name	Weight%	Classification	H Statements
000100-52-7	Benzaldehyde	100	Acute Tox. 4 Inhalation- Acute Tox. 4 Oral- Aquatic Chronic 3- Eye Irrit. 2- Skin Irrit. 2- STOT SE 3 RTI	H302-315-319-332-335-412

CAS-No.	Chemical Name	Weight%	REACH Registration No.	EC/List Number
000100-52-7	Benzaldehyde	100	01-2119455540-44-0007	202-860-4

See Section 16 for full text of H (Hazard) statements (EC 1272/2008).

Amounts specified are typical and do not represent a specification. Remaining components are proprietary, non-hazardous, and/or present at amounts below reportable limits.

SECTION 4: First aid measures

4.1. Description of first aid measures:

General: If irritation or other symptoms occur or persist from any route of exposure, remove the affected individual from the area: see a physician/get medical attention.

Eye contact: Immediately flush eyes with plenty of clean water for an extended time, not less than fifteen (15) minutes. Flush

longer if there is any indication of residual chemical in the eye. Ensure adequate flushing of the eyes by separating the eyelids with fingers and roll eyes in a circular motion. If eye irritation persists: Get medical advice/attention.

Skin contact: Immediately remove contaminated clothing and shoes. Wash the affected area with plenty of soap and water until no evidence of the chemical remains (at least 15-20 minutes). Launder clothing before reuse. If skin irritation occurs: Get medical advice/attention.

Inhalation: If affected, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Call a POISON CENTER or doctor/physician if you feel unwell.

Ingestion: Do not induce vomiting. Never give anything by mouth to an unconscious person. Rinse out the mouth with water. Get medical attention immediately.

Protection of first aid responders: Wear proper personal protective clothing and equipment.

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

Dizziness, Drowsiness, Headache, Irritation, Nausea. Preexisting sensitization, skin and/or respiratory disorders or diseases may be aggravated. See section 11 for additional information.

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

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media:

Suitable: Use dry chemical, "alcohol" foam, carbon dioxide or water spray.

Unsuitable: None known.

5.2. Special hazards arising from the substance or mixture:

Unusual fire/explosion hazards: Issue warning: combustible liquid. Eliminate all ignition sources. Ventilate the area. If spill is large, be prepared to isolate the hazard area. Deny access to the spill area to persons who are not involved in the cleanup and/or who have not been properly trained in spill management of hazardous/flammable liquids. Vapors may explode if ignited in an enclosed area. Run off to sewer may cause a fire or explosion hazard. Protect product from flames of any kind; maintain proper clearance when using heat devices, etc. Closed container may rupture (due to build up in pressure) when exposed to extreme heat. Product may burn if an ignition source is present. BENZALDEHYDE: Finely dispersed benzaldehyde may ignite spontaneously. Rags used to wipe up spills or activated carbon used to absorb vapors of benzaldehyde have been known to ignite spontaneously. Benzaldehyde has a low autoignition temperature and can be ignited by exposed low pressure steam piping or other heated surfaces. Explosion is possible above the upper explosion limit due to the partial oxidation of benzaldehyde to benzoic acid. May form peroxides in contact with air.

Hazardous combustion products: Irritating or toxic substances will be emitted upon burning, combustion or decomposition. See section 10 (10.6 Hazardous decomposition products) for additional information.

5.3. Advice for firefighters:

Use water/water spray to keep fire-exposed containers cool. Water spray may be used to flush spills away from exposures and to dilute spills to non-combustible mixtures. Do not flush combustible liquids into sewer as a fire or vapor explosion hazard may result. Never direct a hose stream directly onto a burning flammable/combustible liquid. Solid or straight hose stream will cause fire to spread if directed onto a burning spill or into an open container of burning liquid. Wear self-contained breathing apparatus (SCBA) equipped with a full facepiece and operated in a pressure-demand mode (or other positive pressure mode) and approved protective clothing. Personnel without suitable respiratory protection must leave the area to prevent significant exposure to hazardous gases from combustion, burning or decomposition. In an enclosed or poorly ventilated area, wear SCBA during cleanup immediately after a fire as well as during the attack phase of firefighting operations.

See section 9 for additional information.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures:

See Section 8 for recommendations on the use of personal protective equipment. Eliminate ignition sources. Ventilate areas of spill. Personal Protective Equipment must be worn.

6.2. Environmental precautions:

Do not flush liquid into public sewer, water systems or surface waters.

6.3. Methods and material for containment and cleaning up:

Contain by diking with sand, earth or other non-combustible material. Wear proper personal protective clothing and equipment. Absorb spill with an inert material. Place into labeled, closed container; store in safe location to await disposal. Change contaminated clothing and launder before reuse.

6.4. References to other sections:

See Section 8 for recommendations on the use of personal protection and Section 13 for waste disposal.

SECTION 7: Handling and storage

7.1. Precautions for safe handling:

As with any chemical product, use good laboratory/workplace procedures. Do not cut, puncture, or weld on or near the container. Do not breathe dust, vapor, aerosol, mist or gas. Do not ingest, taste, or swallow. Wash thoroughly after handling this product. Always wash up before eating, smoking or using the facilities. Use under well-ventilated conditions. Avoid eye and skin contact. Wash contaminated clothing before reuse. Provide eyewash fountains and safety showers in the work area. Bond and ground all containers when transferring chemical. Eliminate ignition sources (e.g., sparks, static buildup, excessive heat, etc.). Use spark-proof tools and equipment. Vapors may travel to distant ignition sources.

7.2. Conditions for safe storage, including any incompatibilities:

Store in combustible storage area and away from heat and open flame. Keep away from heat, sparks and open flames. Store under well-ventilated conditions. Keep container upright, when not in use, to prevent leakage. Avoid storing containers in direct sunlight as vapors may accumulate in the head space creating pressure. Store this material away from incompatible substances (see section 10). Do not store in open, unlabeled or mislabeled containers. Keep container closed when not in use. Emptied container may contain residual vapors or liquid which may ignite or explode. Do not reuse empty container without commercial cleaning or reconditioning. Bond and ground all containers when transferring chemical. Avoid storage in aluminum or iron containers. Product can easily oxidize. It is recommended that opened containers be padded with nitrogen. Protect from light. Storage tank openings should be inspected frequently since benzoic acid can form from oxidation of product and may clog openings.

7.3. Specific end use(s):

Further information concerning special risk management measures: see annex of this safety data sheet (exposure scenarios).

SECTION 8: Exposure controls / personal protection

8.1. Control parameters:

Occupational exposure limits (OEL):

Chemical Name	EU OELV	EU IOELV	ACGIH - TWA/Ceiling	ACGIH - STEL
Benzaldehyde	N/E	N/E	N/E	N/E

Chemical Name	UK WEL	Ireland OEL
Benzaldehyde	N/E	N/E

N/E=Not established (no exposure limits established for the listed substances for listed country/region/organization).

Derived No Effect Levels (DNELs):

Benzaldehyde

Population	Route	Acute (local)	Acute (systemic)	Long Term (local)	Long Term (systemic)
Workers	Inhalation	N/E	N/E	9,8 mg/m3	9,8 mg/m3
Workers	Dermal	1% in mixture (weight basis)	N/E	N/E	1,14 mg/kg bw/day
General population	Inhalation	N/E	N/E	4,9 mg/m3	4,9 mg/m3
General population	Dermal	1% in mixture (weight basis)	N/E	N/E	0,67 mg/kg bw/day
General population	Oral	N/E	N/E	N/E	0,67 mg/kg bw/day

Predicted No Effect Concentration (PNECs):

Benzaldehyde

Compartment	PNEC

Compartment	PNEC
Freshwater	0,0024 mg/L
Freshwater sediment	0,0221 mg/kg ,dw
Marine water	0,00024 mg/L
Marine water sediment	0,00221 mg/kg ,dw
Intermittent releases	0,0107 mg/L
Soil	0,00301 mg/kg ,dw
STP	7,59 mg/L
Oral	No potential for bioaccumulation

8.2. Exposure controls:

Appropriate engineering controls: Always provide effective general and, when necessary, local exhaust ventilation to draw spray, aerosol, fume, mist and vapor away from workers to prevent routine inhalation. Ventilation must be adequate to maintain the ambient workplace atmosphere below the exposure limit(s) outlined in the SDS. Eliminate ignition sources (e.g., sparks, static buildup, excessive heat, etc.).

Individual protection measures, such as personal protective equipment:

Eye/face protection: Safety glasses or goggles required.

Hand protection: Avoid skin contact when mixing or handling the material by wearing impervious and chemical resistant gloves. In case of prolonged immersion or frequently repeated contact, gloves with breakthrough times greater than 480 minutes (protection class 6) are recommended. For brief contact or splash applications, gloves with breakthrough times of 30 minutes or greater are recommended (protection class 2 or greater). Suggested materials for protective gloves: Butyl rubber, Viton. Incompatible materials: neoprene / natural rubber / nitrile / PVC. The protective gloves to be used must comply with the specifications of the EC directive 89/686/EEC and the resultant standard EN 374. Suitability and durability of a glove is dependent on usage (e.g. frequency and duration of contact, other chemicals which may be handled, chemical resistance of glove material and dexterity). Always seek advice of the glove supplier as to the most suitable glove material.

Skin and body protection: Use good laboratory/workplace procedures including personal protective clothing: labcoat, safety glasses and protective gloves.

Respiratory protection: In case of insufficient ventilation, wear suitable respiratory equipment. Wear an approved respirator (e.g., an organic vapor respirator, a full face air purifying respirator for organic vapors, or a self-contained breathing apparatus) whenever exposure to aerosol, mist, spray, fume or vapor exceed the applicable exposure limit(s) of any chemical substance listed in this SDS.

Further information: Eyewash fountains and safety showers are recommended in the work area.

Environmental exposure controls: See Sections 6 and 12.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties:

Form:	Liquid	**pH:**	Not Available
Appearance:	Colorless to light yellow	**Relative density:**	1.041-1.046 @ 25°C
Odour:	Almond	**Partition coefficient (n-octanol/water):**	1.4 @ 25°C
Odour threshold:	Not Available	**% Volatile by weight:**	100%
Solubility in water:	6.95 g/l @ 25°C	**VOC:**	100%
Evaporation rate:	0.04 (Butyl acetate=1)	**Boiling point °C:**	179 °C @ 760 mm Hg
Vapour pressure:	169 Pa @ 25°C	**Boiling point °F:**	354 °F @ 760 mm Hg
Vapour density:	3.66 (Air=1)	**Flash point:**	62-64 °C (144-147 °F) Closed Cup
Viscosity:	1.321 centipoise @ 25 °C	**Autoignition temperature:**	192 °C (378 °F)
Melting point/Freezing point:	-26 °C (-15 °F) @ 760 mm Hg	**Flammability (solid, gas):**	Not Applicable (liquid)
Oxidising properties:	Not oxidizing	**Flammability or explosive limits:**	LFL/LEL: 1.4%
Explosive properties:	Not explosive		UFL/UEL: 8.5%
Decomposition temperature:	Not Available		

9.2. Other information:

Amounts specified are typical and do not represent a specification.

SECTION 10: Stability and reactivity

10.1. Reactivity:

BENZALDEHYDE: Benzaldehyde readily undergoes oxidation by air to form benzoic acid.

10.2. Chemical stability:

This product is stable. BENZALDEHYDE: Stable at normal temperatures and pressures. Benzaldehyde readily undergoes oxidation by air, particularly in the presence of minute traces of iron or on exposure to light. May discolor on exposure to light or air.

10.3. Possibility of hazardous reactions:

Hazardous polymerization will not occur. BENZALDEHYDE: May form peroxides in contact with air.

10.4. Conditions to avoid:

BENZALDEHYDE: Avoid exposure to air, light, moisture, ignition sources and elevated temperatures.

10.5. Incompatible materials:

Reacts violently with peroxyformic acid. Avoid contact with strong oxidizing agents, reducing agents, acids, bases, iron, phenol, aluminum, brass, copper, bronze, alkali metals and oxygen. Attacks some forms of plastics, rubbers, and coatings.

10.6. Hazardous decomposition products:

Carbon monoxide, carbon dioxide, peroxides, benzoic acid.

SECTION 11: Toxicological information

11.1. Information on toxicological effects:

Information on likely routes of exposure:

General: Caution must be exercised through the prudent use of protective equipment and handling procedures to minimize exposure. BENZALDEHYDE: Liver, kidney, and central nervous system effects have been observed during testing in laboratory animals.

Eyes: Causes serious eye irritation.

Skin: Causes skin irritation. May be absorbed through the skin. Prolonged or repeated contact with skin may defat the skin and may cause contact dermatitis. Sensitive individuals may develop a rash from contact with benzaldehyde.

Inhalation: Harmful if inhaled. May cause respiratory tract irritation. May act as a local anesthetic and narcotic at high concentrations. Inhalation of concentrated vapors may irritate the nose and throat and may produce central nervous system depression with possible respiratory failure. Overexposure may cause nausea, headache and vomiting.

Ingestion: Harmful if swallowed. Overexposure may cause nausea, headache and vomiting.

Acute toxicity information: Harmful if inhaled - Category 4. Harmful if swallowed - Category 4.

Chemical Name	Inhalation LC50	Species	Oral LD50	Species	Dermal LD50	Species
Benzaldehyde	>1-<5 mg/L (4 hours)	Rat/ adult	1430 mg/kg	Rat/ adult male	>2000 mg/kg (based on benzoic acid)	Rabbit/ adult

Skin corrosion/irritation: Causes skin irritation - Category 2.

Chemical Name	Skin irritation	Species
Benzaldehyde	Moderate irritant	Weight of evidence

Serious eye damage/irritation: Causes serious eye irritation - Category 2.

Chemical Name	Eye irritation	Species
Benzaldehyde	Slight irritant	Rabbit/ adult

Respiratory or skin sensitization: Not classified (based on available data, the classification criteria are not met).

Chemical Name	Skin sensitisation	Species
Benzaldehyde	Non-sensitizer	Guinea pig and Human

Carcinogenicity: Not classified (based on available data, the classification criteria are not met). BENZALDEHYDE: Under the conditions of the two year gavage study, there was no evidence of carcinogenic activity of benzaldehyde for male or female 344/N rats receiving 200 or 400 mg/kg bw/day. NOAEL (carcinogenicity), rat: >400 mg/kg bw/day. Under the conditions of the two year gavage study, there was some evidence of carcinogenic activity of benzaldehyde for male and female mice at 300 mg/kg bw/day and above, as indicated by increased incidences of squamous cell papillomas (benign) and hyperplasia of the forestomach. LOAEL (chronic), mice: >300 mg/kg bw/day. No carcinomas were observed. It cannot be excluded that the observed effects on the forestomach are related to the irritant properties of benzaldehyde.

Germ cell mutagenicity: Not classified (based on available data, the classification criteria are not met). BENZALDEHYDE: Benzaldehyde was not mutagenic in several Ames assay and reverse mutation studies. Mutagenic effects have been observed on tests in the mouse lymphoma, sister chromatid exchanges (in Chinese hamster ovary (CHO) cells) and chromosome aberrations (in Chinese hamster lung (CHL) cells) assays. Mutagenicity was negative in in-vivo sex-linked recessive lethal mutation assays with Drosophila melanogaster. No adequate in vivo data are available that confirm the weakly positive in-vitro results.

Reproductive toxicity: Not classified (based on available data, the classification criteria are not met). BENZALDEHYDE - READ-ACROSS: Reproductive toxicity (benzoic acid), 4-generation oral study in rats: NOAEL (no-observed adverse-effect-level) of 500 mg/kg/day. Developmental toxicity (sodium benzoate), oral, rats and mice: NOAEL of >=175 mg/kg bw/day can be established for developmental effects.

Specific target organ toxicity (STOT) - single exposure: May cause respiratory irritation - Category 3. BENZALDEHYDE: Based on acute inhalation toxicity studies on sensory irritation, it cannot be excluded that benzaldehyde induces sensory irritation in rodents.

Specific target organ toxicity (STOT) - repeated exposure: Not classified (based on available data, the classification criteria are not met). BENZALDEHYDE: Repeated dose toxicity study, rat, inhalation (vapor), 14 days: LOAEC (Lowest-Observed-Adverse-Effect-Concentration) - 2200 mg/m3. Repeated dose (long-term inclusive) oral toxicity studies showed a LOAEL (Lowest-Observed-Adverse-Effect-Level) of 300 mg/kg bw/day (mouse); NOAEL (No-Observed-Adverse-Effect-Level), oral, rat - 400 mg/kg bw/day.

Aspiration hazard: Not classified (based on available data, the classification criteria are not met).

Other toxicity information: No additional information available.

SECTION 12: Ecological information

12.1. Toxicity:

BENZALDEHYDE: Microorganism Toxicity (activated sludge): The acute EC50 is 759 mg/L, 3 hours.

Chemical Name	Species	Acute	Acute	Chronic
Benzaldehyde	Fish	LC50 1.07 mg/L (96 hours)	LC50 11.2 mg/L(96 hours)	NOEC 0.12 mg/L (7 days)
Benzaldehyde	Invertebrates	EC50 19.7 mg/L (48 hours) (geometric mean measured)	EC50 50 mg/L(24 hours)	N/E
Benzaldehyde	Algae	EC50 33.1 mg/L (72 hours) (geometric mean measured)	EC50 23.1 mg/L(96 hours) (calculated)	NOEC 0.0235 mg/L(72 hours) (geometric mean measured)

12.2. Persistence and degradability:

Chemical Name	Biodegradation
Benzaldehyde	Readily biodegradable (weight of evidence)

12.3. Bioaccumulative potential:

Chemical Name	Bioconcentration Factor (BCF)	Log Kow
Benzaldehyde	N/E	1.4 @ 25°C

12.4. Mobility in soil:

Chemical Name	Mobility in soil (Koc/Kow)
Benzaldehyde	32.7 L/kg (calculated)

12.5. Results of PBT and vPvB assessment:

This product does not meet the PBT and vPvB classification criteria.

12.6. Other adverse effects:

No additional information available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods:

Dispose of unused contents (incineration) in accordance with national and local regulations. Dispose of container in accordance with national and local regulations. Ensure the use of properly authorized waste management companies, where appropriate.

See Section 8 for recommendations on the use of personal protective equipment.

SECTION 14: Transport information

The information below is provided to assist in documentation. It may supplement the information on the package. The package in your possession may carry a different version of the label depending on the date of manufacture. Depending on inner packaging quantities and packaging instructions, it may be subject to specific regulatory exceptions.

14.1. UN number: UN1990

14.2. UN proper shipping name:

Benzaldehyde

14.3. Transport hazard class(es):

U.S. DOT hazard class: 9
Canada TDG hazard class: 9
Europe ADR/RID hazard class: 9
IMDG Code (ocean) hazard class: 9
ICAO/IATA (air) hazard class: 9

A "N/A" listing for the hazard class indicates the product is not regulated for transport by that regulation.

14.4. Packing group: III

14.5. Environmental hazards:

Marine pollutant: Not Applicable

Hazardous substance (USA): Not Applicable

14.6. Special precautions for user:

Not Applicable

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

Not Applicable

SECTION 15: Regulatory information

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

Europe REACh (EC) 1907/2006: Applicable components are registered, exempt or otherwise compliant. REACh is only relevant to substances either manufactured or imported into the EU. Emerald Performance Materials has met its obligations under the REACh regulation. REACh information regarding this product is provided for informational purposes only. Each Legal Entity may have differing REACh obligations, depending on their place in the supply chain. For material manufactured outside of the EU, the importer of record must understand and meet their specific obligations under the regulation.

EU Authorizations and/or restrictions on use: Not Applicable

Other EU information: No Additional Information

National regulations: No Additional Information

Chemical inventories:

Regulation	Status
Australian Inventory of Chemical Substances (AICS):	Y
Canadian Domestic Substances List (DSL):	Y
Canadian Non-Domestic Substances List (NDSL):	N
China Inventory of Existing Chemical Substances (IECSC):	Y

Regulation	Status
European EC Inventory (EINECS, ELINCS, NLP):	Y
Japan Existing and New Chemical Substances (ENCS):	Y
Japan Industrial Safety and Health Law (ISHL):	Y
Korean Existing and Evaluated Chemical Substances (KECL):	Y
New Zealand Inventory of Chemicals (NZIoC):	Y
Philippines Inventory of Chemicals and Chemical Substances (PICCS):	Y
Taiwan Inventory of Existing Chemicals:	Y
U.S. Toxic Substances Control Act (TSCA):	Y

A "Y" listing indicates all intentionally added components are either listed or are otherwise compliant with the regulation. A "N" listing indicates that for one or more components: 1) there is no listing on the public inventory; 2) no information is available; or 3) the component has not been reviewed. A "Y" for New Zealand may mean that a qualified group standard may exist for the components in this product.

15.2. Chemical safety assessment:

A chemical safety assessment has been carried out for the substance or mixture.

SECTION 16: Other information

Hazard (H) Statements in the Composition section (Section 3):

H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H412	Harmful to aquatic life with long lasting effects.

Reason for revision: Changes in Section(s): Annex

Evaulation method for classification of mixtures: Not Applicable (substance)

Legend:

* : Trademark owned by Emerald Performance Materials, LLC.
ACGIH: American Conference of Governmental Industrial Hygienists
EU OELV: European Union Occupational Exposure Limit Value
EU IOELV: European Union Indicative Occupational Exposure Limit Value
N/A: Not Applicable
N/E: None Established
STEL: Short Term Exposure Limit
TWA: Time Weighted Average (exposure for 8-hour workday)

Users Responsibility/Disclaimer of Liability:

The information set forth herein is based on our current knowledge, and is intended to describe the product solely with respect to health, safety and the environment. As such, it must not be interpreted as a guarantee of any specific property of the product. As a result, the customer shall be solely responsible for deciding whether said information is suitable and beneficial.

Safety Data Sheet Preparer:
Product Compliance Department
Emerald Performance Materials, LLC
1499 SE Tech Center Place, Suite 300
Vancouver, WA 98683
United States

Annex

Exposure Scenarios

Substance information:

Name of substance: Benzaldehyde.
EC# 202-860-4 / CAS# 100-52-7
REACH Registration number: 01-2119455540-44-0007

List of exposure scenarios:

ES1: Formulation of cosmetics/personal care products (COLIPA M1-M8)
ES2: Formulation of pharmaceuticals
ES3: Formulation of flavouring agent in food
ES4: Formulation of perfumes/fragrances
ES5: Use as an intermediate
ES6: Consumer use of cosmetics/personal care products

General remarks:

Benzaldehyde is used as flavor and fragrance additive in formulation of preparations and as an intermediate for synthesis of other substances. The primary long term routes of industrial exposure are skin contact and inhalation. In an industrial setting, ingestion is not an anticipated route of exposure. In accordance to the Article 14 (2a-f) of the REACH Regulation (EC) No 1907/2006, exposure estimation and risk characterisation does not need to be performed if the substance in a preparation is less than 1%. Based on current knowledge there are no preparations / formulations which contain this substance in concentrations > 1% (with exception of the use as a laboratory agent) and therefore the life cycle ends after the formulation and industrial use stage.

Exposure scenario (1): Formulation of cosmetics/personal care products (COLIPA M1-M8)

1. Exposure scenario (1)

Short title of the exposure scenario:

Formulation of cosmetics/personal care products (COLIPA M1-M8)

List of use descriptors:

Product category (PC): PC39
Process category (PROC): PROC1, PROC2, PROC3, PROC5, PROC8a, PROC8b, PROC9, PROC14, PROC15
Environmental release category (ERC): ERC2/CEFIC SpERC COLIPA 1-16

List of names of contributing worker scenarios and corresponding PROCs:

PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.
PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions.
PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition.
PROC5 Mixing or blending in batch processes. Covers mixing or blending of solid or liquid materials in the context of manufacturing or formulating sectors, as well as upon end use.
PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities. Transfer includes loading, filling, dumping, bagging and weighing.
PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities. Transfer includes loading, filling, dumping, bagging.
PROC9 Transfer of substance or mixture into small containers (dedicated filling line, including weighing). Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage.
PROC14 Tabletting, compression, extrusion, pelletisation, granulation. This covers processing of mixtures and/or substances into a defined shape for further use.
PROC15 Use as laboratory reagent. Use of substances at small scale laboratory (< 1 l or 1 kg present at workplace).

Name of contributing environmental scenario and corresponding ERCs:

ERC2 Formulation into mixture.
SpERC COLIPA 1-16: Formulation of low viscosity liquids; Formulation of Fine Fragrances; Formulation of Medium Viscosity Body Care Products; Formulation of High Viscosity Body Care Products; Formulation of Non-liquid Creams; Formulation of cosmetic products involving cleaning with Organic Solvents; Formulation of body care soap.

Further explanations:

This emission scenario was based upon CEFIC (European Chemical Industry Council) specific environmental release categories (SpERCs). Exposure of consumers to substance can be excluded, due to the formulation process being exclusively in an industrial setting.

For further information on standardized use descriptors see the European Chemical Agency (ECHA) Guidance on information requirements and chemical safety assessment, Chapter R.12: Use descriptor system (http://guidance.echa.europa.eu/docs/guidance_document/information_requirements_r12_en.pdf). For further information on CEFIC (The European Chemical Industry Council) Specific Environmental Release Categories (SpERCs), see http://www.cefic.org/Industry-support/Implementing-reach/Libraries/.

2. Conditions of use affecting exposure

2.1 Control of workers exposure

General:	Generally accepted standards of occupational hygiene are maintained. Smoking, eating and drinking are prohibited at the workplace. Spills are cleaned immediately. Local exhaust ventilation and gloves are considered.
Product characteristics:	Physical state: liquid.
Amounts used:	This information is not relevant for assessment of worker's exposure.
Frequency and duration of use/exposure:	Duration: >4 hours/day. Frequency: Repeated exposure (working life, <=240 days/year; 5 days/week).
Human factors not influenced by risk management:	Exposed skin surface: 960 cm2 (two hands).

Other given operational conditions affecting workers exposure:	Location: Indoor use. Domain: Industrial use.
Technical conditions and measures to control dispersion from source towards the worker:	Local exhaust ventilation: Yes (PROC5, PROC8a). Local exhaust ventilation: Not required (PROC1, PROC2, PROC3, PROC8b, PROC9, PROC14, PROC15)
Conditions and measures related to personal protection, hygiene and health evaluation:	Gloves (90% efficiency) should be worn for PROC2, PROC8b, PROC9 and PROC14. Generally accepted standards of occupational hygiene are maintained.
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:	Use Local Exhaust ventilation. Generally accepted standards of occupational hygiene are maintained. Minimisation of manual phases/work tasks. Minimisation of splashes and spills. Avoidance of contact with contaminated tools and objects. Regular cleaning of equipment and work area. Training staff on good practice.

2.2 Control of environmental exposure

General:	All risk management measures utilised must also comply with all relevant local regulations. Primary risk management measure: discharge to on-site sewage treatment plant (STP). Alternative risk management measure: discharge of all wastes to a municipal sewage treatment plant (WWTP); or incineration of all waste.
Product characteristics:	Concentration of substance in product: Up to 1%. Physical state: liquid.
Amounts used:	Maximum daily use at a site: 7.07 kg/day. Maximum annual use at a site: 2.12 tons/year. Fraction of the main local source: 0.02.
Frequency and duration of use:	Emission days: 300 days/year.
Environmental factors not influenced by risk management:	Flow rate of receiving surface water: >=18,000 m3/day (default). Dilution factor: 10 (freshwater), 100 (seawater).
Other given operational conditions affecting environmental exposure:	Industry category: 5/0: Personal/Domestic use. Use category: 15: Cosmetics. Indoor use. Formulating temperature: max 50°C. Release fraction to air from process: 0.025 (ERC2). Release fraction to wastewater from process: 0.02 (ERC2). Release fraction to surface water from process: 0 (EUSES). Release fraction to soil from process: 0.0001 (ERC2).
Organisational measures to prevent/limit releases from site:	Municipal Sewage Treatment Plant (STP): Yes (freshwater), Yes (marine assessment).
Conditions and measures related to municipal sewage treatment plant:	Size of municipal sewage system/treatment plant: >=2000 m3/day (standard town). Fraction of emissions degraded in STP: Efficiency=86.5%.
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:	Spills are cleaned immediately. Any wastes and solutions tha contain residues of substance are disposed in accordance to national and international regulations. All risk management measures utilised must also comply with all relevant local regulations.

3. Exposure estimation and reference to its source

Health

Information for contributing scenario (1): PROC8b, PROC9

Assessment method: ECETOC TRA Worker. Only highest figures are presented here.

Exposure estimation: The exposure scenario categories consist of a number of activities. An individual worker may conduct one or several of these activities during one shift and a specific PROC or PROCs have been identified as worst-case activities for combined exposure. If parts of the worker's shift are spent conducting PROCs other than the worst-case PROC activities, the daily exposure of this worker will be lower than estimated for the worst case.

	Route	Exposure estimate	RCR	Notes
Worker, long-term, systemic	Dermal	0.686 mg/kg bw/day	0.602	PROC8b, PROC9
Worker, long-term, systemic	Inhalation	2.21 mg/m3	0.225	PROC8b, PROC9
Worker, long-term, systemic	Combined routes	N/A	0.827	PROC8b, PROC9

Environment

Information for contributing scenario (2): ERC2

Assessment method: EUSES v2.1.

Exposure estimation:

Compartment	PEC	RCR	Notes
Freshwater	0.000901 mg/L	0.375	
Freshwater sediment	0.00828 mg/kg dw	0.375	
Marine water	0.0000899 mg/L	0.374	
Marine water sediment	0.000826 mg/kg dw	0.374	
Soil	0.00105 mg/kg dw	0.350	
STP	0.00878 mg/L	0.00116	

RCR=Risk characterization ratio (PEC/PNEC or Exposure estimate/DNEL); PEC=Predicted environmental concentration.

4. Guidance to the Downstream User to evaluate whether he works inside the boundaries set by the ES

Health:	Indoor use, LEV used, with gloves, no respirator required. Duration of activity >4 hours. Exposed skin surface: 960 cm2 (two hands).
Environment:	Maximum daily use at a site: 7.07 kg/day. Concentration of substance in product: Up to 1%. Primary risk management measure: discharge to on-site sewage treatment plant (STP). Alternative risk management measure: discharge of all wastes to a municipal sewage treatment plant (WWTP); or incineration of all waste.

Exposure scenario (2): Formulation of pharmaceuticals

1. Exposure scenario (2)

Short title of the exposure scenario:

Formulation of pharmaceuticals

List of use descriptors:

Product category (PC): PC28, PC29
Process category (PROC): PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC9, PROC14, PROC15
Environmental release category (ERC): ERC2, ERC3

List of names of contributing worker scenarios and corresponding PROCs:

PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.
PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions.
PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition.
PROC4 Chemical production where opportunity for exposure arises.
PROC5 Mixing or blending in batch processes. Covers mixing or blending of solid or liquid materials in the context of manufacturing or formulating sectors, as well as upon end use.
PROC6 Calendering operations. Processing of large surfaces at elevated temperature e.g. calendering of textile, rubber or paper.
PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities. Transfer includes loading, filling, dumping, bagging and weighing.
PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities. Transfer includes loading, filling, dumping, bagging.
PROC9 Transfer of substance or mixture into small containers (dedicated filling line, including weighing). Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage.
PROC14 Tabletting, compression, extrusion, pelletisation, granulation. This covers processing of mixtures and/or substances into a defined shape for further use.
PROC15 Use as laboratory reagent. Use of substances at small scale laboratory (< 1 l or 1 kg present at workplace).

Name of contributing environmental scenario and corresponding ERCs:

ERC2 Formulation into mixture.
ERC3 Formulation into solid matrix.

Further explanations:

Exposure of consumers to substance can be excluded, due to the formulation process being exclusively in an industrial setting.

For further information on standardized use descriptors see the European Chemical Agency (ECHA) Guidance on information requirements and chemical safety assessment, Chapter R.12: Use descriptor system (http://guidance.echa.europa.eu/docs/guidance_document/information_requirements_r12_en.pdf).

2. Conditions of use affecting exposure

2.1 Control of workers exposure

General:	Generally accepted standards of occupational hygiene are maintained. Smoking, eating and drinking are prohibited at the workplace. Spills are cleaned immediately. Local exhaust ventilation and gloves are considered.
Product characteristics:	Physical state: liquid.
Amounts used:	This information is not relevant for assessment of worker's exposure.
Frequency and duration of use/exposure:	Duration: >4 hours/day. Frequency: Repeated exposure (working life, <=240 days/year; 5 days/week).

Human factors not influenced by risk management:	Exposed skin surface: 960 cm2 (two hands).
Other given operational conditions affecting workers exposure:	Location: Indoor use. Domain: Industrial use.
Technical conditions and measures to control dispersion from source towards the worker:	Local exhaust ventilation: Yes (PROC5, PROC6, PROC8a). Local exhaust ventilation: Not required (PROC1, PROC2, PROC3, PROC4, PROC8b, PROC9, PROC14, PROC15)
Conditions and measures related to personal protection, hygiene and health evaluation:	Gloves (90% efficiency) should be worn for PROC2, PROC4, PROC6, PROC8b, PROC9 and PROC14. Generally accepted standards of occupational hygiene are maintained.
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:	Use Local Exhaust ventilation. Generally accepted standards of occupational hygiene are maintained. Minimisation of manual phases/work tasks. Minimisation of splashes and spills. Avoidance of contact with contaminated tools and objects. Regular cleaning of equipment and work area. Training staff on good practice.
2.2 Control of environmental exposure	
General:	All risk management measures utilised must also comply with all relevant local regulations. Primary risk management measure: discharge to on-site sewage treatment plant (STP). Alternative risk management measure: discharge of all wastes to a municipal sewage treatment plant (WWTP); or incineration of all waste.
Product characteristics:	Concentration of substance in product: Up to 1%. Physical state: liquid.
Amounts used:	Maximum daily use at a site: 7.07 kg/day. Maximum annual use at a site: 2.12 tons/year. Fraction of the main local source: 0.02.
Frequency and duration of use:	Emission days: 300 days/year.
Environmental factors not influenced by risk management:	Flow rate of receiving surface water: >=18,000 m3/day (default). Dilution factor: 10 (freshwater), 100 (seawater).
Other given operational conditions affecting environmental exposure:	Industry category: 15/0: Others. Use category: 55: Others. Indoor use. Formulating temperature: max 50°C. Release fraction to air from process: 0.025 (ERC2). Release fraction to wastewater from process: 0.02 (ERC2). Release fraction to surface water from process: 0 (EUSES). Release fraction to soil from process: 0.0001 (ERC2).
Organisational measures to prevent/limit releases from site:	Municipal Sewage Treatment Plant (STP): Yes (freshwater), Yes (marine assessment).
Conditions and measures related to municipal sewage treatment plant:	Size of municipal sewage system/treatment plant: >=2000 m3/day (standard town). Fraction of emissions degraded in STP: Efficiency=86.5%.
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:	Spills are cleaned immediately. Any wastes and solutions tha contain residues of substance are disposed in accordance to national and international regulations. All risk management measures utilised must also comply with all relevant local regulations.

3. Exposure estimation and reference to its source

Health

Information for contributing scenario (1): PROC4, PROC8b, PROC9

Assessment method: ECETOC TRA Worker. Only highest figures are presented here.

Exposure estimation: The exposure scenario categories consist of a number of activities. An individual worker may conduct one or several of these activities during one shift and a specific PROC or PROCs have been identified as worst-case activities for combined exposure. If parts of the worker's shift are spent conducting PROCs other than the worst-case PROC activities, the daily exposure of this worker will be lower than estimated for the worst case.

	Route	Exposure estimate	RCR	Notes
Worker, long-term, systemic	Dermal	0.686 mg/kg bw/day	0.602	PROC4, PROC8b, PROC9
Worker, long-term, systemic	Inhalation	2.21 mg/m3	0.225	PROC4, PROC8b, PROC9
Worker, long-term, systemic	Combined routes	N/A	0.827	PROC4, PROC8b, PROC9

Environment

Information for contributing scenario (2): ERC2

Assessment method: EUSES v2.1. EUSES v2.1. Only values calculated for ERC2 (selected as the worst case environmental release category) are presented here.

Exposure estimation:

Compartment	PEC	RCR	Notes
Freshwater	0.000903 mg/L	0.376	
Freshwater sediment	0.00830 mg/kg dw	0.376	
Marine water	0.0000901 mg/L	0.375	
Marine water sediment	0.000828 mg/kg dw	0.375	
Soil	0.00106 mg/kg dw	0.351	
STP	0.0088 mg/L	0.00116	

RCR=Risk characterization ratio (PEC/PNEC or Exposure estimate/DNEL); PEC=Predicted environmental concentration.

4. Guidance to the Downstream User to evaluate whether he works inside the boundaries set by the ES

Health:	Indoor use, LEV used, with gloves, no respirator required. Duration of activity >4 hours. Exposed skin surface: 960 cm2 (two hands).
Environment:	Maximum daily use at a site: 7.07 kg/day. Concentration of substance in product: Up to 1%. Primary risk management measure: discharge to on-site sewage treatment plant (STP). Alternative risk management measure: discharge of all wastes to a municipal sewage treatment plant (WWTP); or incineration of all waste.

Exposure scenario (3): Formulation of flavouring agent in food

1. Exposure scenario (3)

Short title of the exposure scenario:

Formulation of flavouring agent in food

List of use descriptors:

Product category (PC): PC28, PC29

Process category (PROC): PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC9, PROC14, PROC15

Environmental release category (ERC): ERC2, ERC3

List of names of contributing worker scenarios and corresponding PROCs:

PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.

PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions.

PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition.

PROC4 Chemical production where opportunity for exposure arises.

PROC5 Mixing or blending in batch processes. Covers mixing or blending of solid or liquid materials in the context of manufacturing or formulating sectors, as well as upon end use.

PROC6 Calendering operations. Processing of large surfaces at elevated temperature e.g. calendering of textile, rubber or paper.

PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities. Transfer includes loading, filling, dumping, bagging and weighing.

PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities. Transfer includes loading, filling, dumping, bagging.

PROC9 Transfer of substance or mixture into small containers (dedicated filling line, including weighing). Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage.

PROC14 Tabletting, compression, extrusion, pelletisation, granulation. This covers processing of mixtures and/or substances into a defined shape for further use.

PROC15 Use as laboratory reagent. Use of substances at small scale in laboratories (less than or equal to 1 l or 1 kg present at workplace).

Name of contributing environmental scenario and corresponding ERCs:

ERC2 Formulation into mixture.

ERC3 Formulation into solid matrix.

Further explanations:

Exposure of consumers to substance can be excluded, due to the formulation process being exclusively in an industrial setting.

For further information on standardized use descriptors see the European Chemical Agency (ECHA) Guidance on information requirements and chemical safety assessment, Chapter R.12: Use descriptor system (http://guidance.echa.europa.eu/docs/guidance_document/information_requirements_r12_en.pdf).

2. Conditions of use affecting exposure

2.1 Control of workers exposure

General:	Generally accepted standards of occupational hygiene are maintained. Smoking, eating and drinking are prohibited at the workplace. Spills are cleaned immediately. Local exhaust ventilation and gloves are considered.
Product characteristics:	Physical state: liquid.

Amounts used:	This information is not relevant for assessment of worker's exposure.
Frequency and duration of use/exposure:	Duration: >4 hours/day. Frequency: Repeated exposure (working life, <=240 days/year; 5 days/week).
Human factors not influenced by risk management:	Exposed skin surface: 960 cm2 (two hands).
Other given operational conditions affecting workers exposure:	Location: Indoor use. Domain: Industrial use.
Technical conditions and measures to control dispersion from source towards the worker:	Local exhaust ventilation: Yes (PROC5, PROC6, PROC8a). Local exhaust ventilation: Not required (PROC1, PROC2, PROC3, PROC4, PROC8b, PROC9, PROC14, PROC15)
Conditions and measures related to personal protection, hygiene and health evaluation:	Gloves (90% efficiency) should be worn for PROC2, PROC4, PROC6, PROC8b, PROC9 and PROC14. Generally accepted standards of occupational hygiene are maintained.
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:	Use Local Exhaust ventilation. Generally accepted standards of occupational hygiene are maintained. Minimisation of manual phases/work tasks. Minimisation of splashes and spills. Avoidance of contact with contaminated tools and objects. Regular cleaning of equipment and work area. Training staff on good practice.
2.2 Control of environmental exposure	
General:	All risk management measures utilised must also comply with all relevant local regulations. Primary risk management measure: discharge to on-site sewage treatment plant (STP). Alternative risk management measure: discharge of all wastes to a municipal sewage treatment plant (WWTP); or incineration of all waste.
Product characteristics:	Concentration of substance in product: Up to 1%. Physical state: liquid.
Amounts used:	Maximum daily use at a site: 7.07 kg/day. Maximum annual use at a site: 2.12 tons/year. Fraction of the main local source: 0.02.
Frequency and duration of use:	Emission days: 300 days/year.
Environmental factors not influenced by risk management:	Flow rate of receiving surface water: >=18,000 m3/day (default). Dilution factor: 10 (freshwater), 100 (seawater).
Other given operational conditions affecting environmental exposure:	Industry category: 15/0: Others. Use category: 55: Others. Indoor use. Formulating temperature: max 50°C. Release fraction to air from process: 0.025 (ERC2). Release fraction to wastewater from process: 0.02 (ERC2). Release fraction to surface water from process: 0 (EUSES). Release fraction to soil from process: 0.0001 (ERC2).
Organisational measures to prevent/limit releases from site:	Municipal Sewage Treatment Plant (STP): Yes (freshwater), Yes (marine assessment).
Conditions and measures related to municipal sewage treatment plant:	Size of municipal sewage system/treatment plant: >=2000 m3/day (standard town). Fraction of emissions degraded in STP: Efficiency=86.5%.
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:	Spills are cleaned immediately. Any wastes and solutions tha contain residues of substance are disposed in accordance to national and international regulations. All risk management measures utilised must also comply with all relevant local regulations.

3. Exposure estimation and reference to its source

Health

Information for contributing scenario (1): PROC4, PROC8b, PROC9

Assessment method: ECETOC TRA Worker. Only highest figures are presented here.

Exposure estimation: The exposure scenario categories consist of a number of activities. An individual worker may conduct one or several of these activities during one shift and a specific PROC or PROCs have been identified as worst-case activities for combined exposure. If parts of the worker's shift are spent conducting PROCs other than the worst-case PROC activities, the daily exposure of this worker will be lower than estimated for the worst case.

	Route	Exposure estimate	RCR	Notes
Worker, long-term, systemic	Dermal	0.686 mg/kg bw/day	0.602	PROC4, PROC8b, PROC9

	Route	Exposure estimate	RCR	Notes
Worker, long-term, systemic	Inhalation	2.21 mg/m3	0.225	PROC4, PROC8b, PROC9
Worker, long-term, systemic	Combined routes	N/A	0.827	PROC4, PROC8b, PROC9

Environment

Information for contributing scenario (2): ERC2

Assessment method: EUSES v2.1. Only values calculated for ERC2 (selected as the worst case environmental release category) are presented here.

Exposure estimation:

Compartment	PEC	RCR	Notes
Freshwater	0.000903 mg/L	0.376	
Freshwater sediment	0.00830 mg/kg dw	0.376	
Marine water	0.0000901 mg/L	0.375	
Marine water sediment	0.000828 mg/kg dw	0.375	
Soil	0.00106 mg/kg dw	0.351	
STP	0.0088 mg/L	0.00116	

RCR=Risk characterization ratio (PEC/PNEC or Exposure estimate/DNEL); PEC=Predicted environmental concentration.

4. Guidance to the Downstream User to evaluate whether he works inside the boundaries set by the ES

Health:	Indoor use, LEV used, with gloves, no respirator required. Duration of activity >4 hours. Exposed skin surface: 960 cm2 (two hands).
Environment:	Maximum daily use at a site: 7.07 kg/day. Concentration of substance in product: Up to 1%. Primary risk management measure: discharge to on-site sewage treatment plant (STP). Alternative risk management measure: discharge of all wastes to a municipal sewage treatment plant (WWTP); or incineration of all waste.

Exposure scenario (4): Formulation of perfumes/fragrances

1. Exposure scenario (4)

Short title of the exposure scenario:

Formulation of perfumes/fragrances

List of use descriptors:

Product category (PC): PC28, PC29

Process category (PROC): PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC9, PROC14, PROC15

Environmental release category (ERC): ERC2, ERC3

List of names of contributing worker scenarios and corresponding PROCs:

PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.

PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions.

PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition.

PROC4 Chemical production where opportunity for exposure arises.

PROC5 Mixing or blending in batch processes. Covers mixing or blending of solid or liquid materials in the context of manufacturing or formulating sectors, as well as upon end use.

PROC6 Calendering operations. Processing of large surfaces at elevated temperature e.g. calendering of textile, rubber or paper.

PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities. Transfer includes loading, filling, dumping, bagging and weighing.

PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities. Transfer includes loading, filling, dumping, bagging.

PROC9 Transfer of substance or mixture into small containers (dedicated filling line, including weighing). Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage.

PROC14 Tabletting, compression, extrusion, pelletisation, granulation. This covers processing of mixtures and/or substances into a defined shape for further use.

PROC15 Use as laboratory reagent. Use of substances at small scale in laboratories (less than or equal to 1 l or 1 kg present at workplace).

Name of contributing environmental scenario and corresponding ERCs:

ERC2 Formulation into mixture.

ERC3 Formulation into solid matrix.

Further explanations:

Exposure of consumers to substance can be excluded, due to the formulation process being exclusively in an industrial setting.

For further information on standardized use descriptors see the European Chemical Agency (ECHA) Guidance on information requirements and chemical safety assessment, Chapter R.12: Use descriptor system (http://guidance.echa.europa.eu/docs/guidance_document/information_requirements_r12_en.pdf).

2. Conditions of use affecting exposure

2.1 Control of workers exposure

General:	Generally accepted standards of occupational hygiene are maintained. Smoking, eating and drinking are prohibited at the workplace. Spills are cleaned immediately. Local exhaust ventilation and gloves are considered.
Product characteristics:	Physical state: liquid.
Amounts used:	This information is not relevant for assessment of worker's exposure.
Frequency and duration of use/exposure:	Duration: >4 hours/day. Frequency: Repeated exposure (working life, <=240 days/year; 5 days/week).
Human factors not influenced by risk management:	Exposed skin surface: 960 cm2 (two hands).
Other given operational conditions affecting workers exposure:	Location: Indoor use. Domain: Industrial use.
Technical conditions and measures to control dispersion from source towards the worker:	Local exhaust ventilation: Yes (PROC5, PROC6, PROC8a). Local exhaust ventilation: Not required (PROC1, PROC2, PROC3, PROC4, PROC8b, PROC9, PROC14, PROC15)
Conditions and measures related to personal protection, hygiene and health evaluation:	Gloves (90% efficiency) should be worn for PROC2, PROC4, PROC6, PROC8b, PROC9 and PROC14. Generally accepted standards of occupational hygiene are maintained.
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:	Use Local Exhaust ventilation. Generally accepted standards of occupational hygiene are maintained. Minimisation of manual phases/work tasks. Minimisation of splashes and spills. Avoidance of contact with contaminated tools and objects. Regular cleaning of equipment and work area. Training staff on good practice.
2.2 Control of environmental exposure	
General:	All risk management measures utilised must also comply with all relevant local regulations. Primary risk management measure: discharge to on-site sewage treatment plant (STP). Alternative risk management measure: discharge of all wastes to a municipal sewage treatment plant (WWTP); or incineration of all waste.
Product characteristics:	Concentration of substance in product: Up to 1%. Physical state: liquid.
Amounts used:	Maximum daily use at a site: 7.07 kg/day. Maximum annual use at a site: 2.12 tons/year. Fraction of the main local source: 0.02.
Frequency and duration of use:	Emission days: 300 days/year.
Environmental factors not influenced by risk management:	Flow rate of receiving surface water: >=18,000 m3/day (default). Dilution factor: 10 (freshwater), 100 (seawater).
Other given operational conditions affecting environmental exposure:	Industry category: 15/0: Others. Use category: 55: Others. Indoor use. Formulating temperature: max 50°C. Release fraction to air from process: 0.025 (ERC2). Release fraction to wastewater from process: 0.02 (ERC2). Release fraction to surface water from process: 0 (EUSES). Release fraction to soil from process: 0.0001 (ERC2).
Organisational measures to prevent/limit releases from site:	Municipal Sewage Treatment Plant (STP): Yes (freshwater), Yes (marine assessment).
Conditions and measures related to municipal sewage treatment plant:	Size of municipal sewage system/treatment plant: >=2000 m3/day (standard town). Fraction of emissions degraded in STP: Efficiency=86.5%.
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:	Spills are cleaned immediately. Any wastes and solutions tha contain residues of substance are disposed in accordance to national and international regulations. All risk management measures utilised must also comply with all relevant local regulations.

3. Exposure estimation and reference to its source

Health

Information for contributing scenario (1): PROC4, PROC8b, PROC9

Assessment method: ECETOC TRA Worker. Only highest figures are presented here.

Exposure estimation: The exposure scenario categories consist of a number of activities. An individual worker may conduct one or several of these activities during one shift and a specific PROC or PROCs have been identified as worst-case activities for combined exposure. If parts of the worker's shift are spent conducting PROCs other than the worst-case PROC activities, the daily exposure of this worker will be lower than estimated for the worst case.

	Route	Exposure estimate	RCR	Notes
Worker, long-term, systemic	Dermal	0.686 mg/kg bw/day	0.602	PROC4, PROC8b, PROC9
Worker, long-term, systemic	Inhalation	2.21 mg/m3	0.225	PROC4, PROC8b, PROC9
Worker, long-term, systemic	Combined routes	N/A	0.827	PROC4, PROC8b, PROC9

Environment

Information for contributing scenario (2): ERC2

Assessment method: EUSES v2.1. Only values calculated for ERC2 (selected as the worst case environmental release category) are presented here.

Exposure estimation:

Compartment	PEC	RCR	Notes
Freshwater	0.000903 mg/L	0.376	
Freshwater sediment	0.0083 mg/kg dw	0.376	
Marine water	0.0000901 mg/L	0.375	
Marine water sediment	0.000828 mg/kg dw	0.375	
Soil	0.00106 mg/kg dw	0.351	
STP	0.0088 mg/L	0.00116	

RCR=Risk characterization ratio (PEC/PNEC or Exposure estimate/DNEL); PEC=Predicted environmental concentration.

4. Guidance to the Downstream User to evaluate whether he works inside the boundaries set by the ES

Health:	Indoor use, LEV used, with gloves, no respirator required. Duration of activity >4 hours. Exposed skin surface: 960 cm2 (two hands).
Environment:	Maximum daily use at a site: 7.07 kg/day. Concentration of substance in product: Up to 1%. Primary risk management measure: discharge to on-site sewage treatment plant (STP). Alternative risk management measure: discharge of all wastes to a municipal sewage treatment plant (WWTP); or incineration of all waste.

Exposure scenario (5): Use as an intermediate

1. Exposure scenario (5)

Short title of the exposure scenario:

Use as an intermediate

List of use descriptors:

Product category (PC): PC19
Process category (PROC): PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15
Environmental release category (ERC): ERC6a

List of names of contributing worker scenarios and corresponding PROCs:

PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions.
PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions.
PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition.
PROC4 Chemical production where opportunity for exposure arises.
PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities. Transfer includes loading, filling, dumping, bagging and weighing.
PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities. Transfer includes loading, filling, dumping, bagging.
PROC15 Use as laboratory reagent. Use of substances at small scale in laboratories (less than or equal to 1 l or 1 kg present at workplace).

Name of contributing environmental scenario and corresponding ERCs:

ERC6a Use of intermediate.

Further explanations:

Exposure of consumers to substance can be excluded, due to the formulation process being exclusively in an industrial setting.

For further information on standardized use descriptors see the European Chemical Agency (ECHA) Guidance on information requirements and chemical safety assessment, Chapter R.12: Use descriptor system (http://guidance.echa.europa.eu/docs/guidance_document/information_requirements_r12_en.pdf).

2. Conditions of use affecting exposure

2.1 Control of workers exposure

General:	Generally accepted standards of occupational hygiene are maintained. Smoking, eating and drinking are prohibited at the workplace. Spills are cleaned immediately. Local exhaust ventilation and gloves are considered.
Product characteristics:	Physical state: liquid.
Amounts used:	This information is not relevant for assessment of worker's exposure.
Frequency and duration of use/exposure:	Duration: >4 hours/day. Frequency: Repeated exposure (working life, <=240 days/year; 5 days/week).
Human factors not influenced by risk management:	Exposed skin surface: 960 cm2 (two hands).
Other given operational conditions affecting workers exposure:	Location: Indoor use. Domain: Industrial use.
Technical conditions and measures to control dispersion from source towards the worker:	Local exhaust ventilation: Yes (PROC3, PROC4, PROC8a, PROC8b, PROC15). Local exhaust ventilation: Not required (PROC1, PROC2)
Conditions and measures related to personal protection, hygiene and health evaluation:	Gloves (90% efficiency) should be worn for PROC2. Generally accepted standards of occupational hygiene are maintained.
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:	Use Local Exhaust ventilation. Generally accepted standards of occupational hygiene are maintained. Minimisation of manual phases/work tasks. Minimisation of splashes and spills. Avoidance of contact with contaminated tools and objects. Regular cleaning of equipment and work area. Training staff on good practice.
2.2 Control of environmental exposure	
General:	All risk management measures utilised must also comply with all relevant local regulations. Site 1: An on-site STP with aerobic treatment followed by tertiary ozone treatment (98% efficiency). Site 2: The effluent flows to the local municipal treatment plant. There it has an biological aerobic treatment with oxygen not air. Then this is followed by a tertiary ozone treatment plant. The oxygen treatment was put in to remove all the COD such that the ozone could remove the dyes from the dyeing factories in the area. So the removal from the plant is considered to be at least 99% for a readily biodegradable substance such as Benzaldehyde. Site 3: This water is directly sent to a big domestic STP with biological treatment designed for an equivalent population of 358.000 inhabitants, with a daily flow of 43.000 m3/day and with an efficiency >95%.
Product characteristics:	Concentration of substance: Up to 100%. Physical state: liquid.
Amounts used:	Maximum daily use at a site: 9263 kg/day (Site 1) / 4371 kg/day (Site 2) / 2953 kg/day (Site 3). Maximum annual use at a site: 3381 tons/year (Site 1) / 1530 tons/year (Site 2) / 886 tons/year (Site 3). Fraction of the main local source: 1.
Frequency and duration of use:	Emission days: <=365 days/year (Site 1) / <=350 days/year (Site 2) / <=300 days/year (Site 3). Continuous use/release.
Environmental factors not influenced by risk management:	Flow rate of receiving surface water: >=18,000 m3/day (Site 1, Site 3) / >=21,000 m3/day (Site 2). Dilution factor: 10 (freshwater), 100 (seawater) (Site 1, Site 3) / 11.5 (freshwater), 100 (seawater) (Site 2).
Other given operational conditions affecting environmental exposure:	Industry category: 3: Chemical industry - chemicals used in synthesis. Use category: 33: Intermediates. Indoor use. Formulating temperature: max 50°C. Release fraction to air from process: 1E-05. Release fraction to wastewater from process: 5E-04. Release fraction to surface water from process: 0 (EUSES). Release fraction to soil from process: 1E-04.
Organisational measures to prevent/limit releases from site:	Municipal Sewage Treatment Plant (STP): Yes (freshwater), Yes (marine assessment).

Conditions and measures related to municipal sewage treatment plant:	Size of municipal sewage system/treatment plant: >=2000 m3/day (Site 1, Site 2) / : >=43000 m3/day (Site 3). Fraction of emissions degraded in STP: Efficiency=86.5% (Site 1) / Efficiency=99% (Site 2) / Efficiency=95% (Site 3).
Conditions and measures related to external treatment of waste for disposal:	On-site STP with aerobic treatment followed by tertiary ozone treatment, Efficiency=98% (Site 1) / Not relevant (Site 2, Site 3).
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:	Spills are cleaned immediately. Any wastes and solutions tha contain residues of substance are disposed in accordance to national and international regulations. All risk management measures utilised must also comply with all relevant local regulations.

3. Exposure estimation and reference to its source

Health

Information for contributing scenario (1): PROC2

Assessment method: ECETOC TRA Worker. Only highest figures are presented here.

Exposure estimation: The exposure scenario categories consist of a number of activities. An individual worker may conduct one or several of these activities during one shift and a specific PROC or PROCs have been identified as worst-case activities for combined exposure. If parts of the worker's shift are spent conducting PROCs other than the worst-case PROC activities, the daily exposure of this worker will be lower than estimated for the worst case.

	Route	Exposure estimate	RCR	Notes
Worker, long-term, systemic	Dermal	0.137 mg/kg bw/day	0.12	PROC2
Worker, long-term, systemic	Inhalation	4.42 mg/m3	0.451	PROC2
Worker, long-term, systemic	Combined routes	N/A	0.571	PROC2

Environment

Information for contributing scenario (2): ERC6a

Assessment method: EUSES v2.1 based on 3 EU sites. An environmental assessment (site-specific for the three largest users covering 70% of the European market) has been performed using the EUSES and the ERCs for calculating environmental release. Release factors from EUSES have been used to overwrite the release factors based on the ERC because those were closer to realistic release factors provided by industry. The release factors are not taken based on the ERC table in the REACH guidance as they are considered not representative for a closed system intermediate. Instead of these the release factors from EUSES for intermediates, continuous production are considered. This is also substantiated by site-specific information for the above mentioned sites.

Exposure estimation:

Compartment	PEC	RCR	Notes
Freshwater	0.000599 mg/L (1)/ 0.000899 mg/L (2)/ 0.000181 mg/L (3)	0.25 (1)/ 0.375 (2)/ 0.0753 (3)	(1) Site 1/ (2) Site 2/ (3) Site 3
Freshwater sediment	0.00551 mg/kg dw (1)/ 0.00827 mg/kg dw (2)/ 0.00166 mg/kg dw (3)	0.25 (1)/ 0.375 (2)/ 0.0753 (3)	(1) Site 1/ (2) Site 2/ (3) Site 3
Marine water	0.0000597 mg/L (1)/ 0.000103 mg/L (2)/ 0.0000179 mg/L (3)	0.249 (1)/ 0.429 (2)/ 0.0745 (3)	(1) Site 1/ (2) Site 2/ (3) Site 3
Marine water sediment	0.000549 mg/kg dw (1)/ 0.000946 mg/kg dw (2)/ 0.000164 mg/kg dw (3)	0.249 (1)/ 0.429 (2)/ 0.0745 (3)	(1) Site 1/ (2) Site 2/ (3) Site 3
Soil	0.000693 mg/kg dw (1)/ 0.00121 mg/kg dw (2)/ 0.000191 mg/kg dw (3)	0.23 (1)/ 0.401 (2)/ 0.0636 (3)	(1) Site 1/ (2) Site 2/ (3) Site 3
STP	0.00577 mg/L (1)/ 0.0101 mg/L (2)/ 0.00158 mg/L (3)	0.00076 (1)/ 0.00133 (2)/ 0.000209 (3)	(1) Site 1/ (2) Site 2/ (3) Site 3

RCR=Risk characterization ratio (PEC/PNEC or Exposure estimate/DNEL); PEC=Predicted environmental concentration.

4. Guidance to the Downstream User to evaluate whether he works inside the boundaries set by the ES

Health:	Indoor use, LEV used, with gloves, no respirator required. Duration of activity >4 hours. Exposed skin surface: 960 cm2 (two hands).
Environment:	Continuous use/release. Maximum daily use at a site: 9263 kg/day (Site 1) / 4371 kg/day (Site 2) / 2953 kg/day (Site 3). Concentration of substance: Up to 100%. Primary risk management measure: discharge to on-site sewage treatment plant (STP). Alternative risk management measure: discharge of all wastes to a municipal sewage treatment plant (WWTP); or incineration of all waste.

Exposure scenario (6): Consumer use of cosmetics/personal care products

1. Exposure scenario (6)

Short title of the exposure scenario:

Consumer use of cosmetics/personal care products

List of use descriptors:

Product category (PC): PC39

Environmental release category (ERC): ERC8a/CEFIC SpERC COLIPA 17-19

Name of contributing environmental scenario and corresponding ERCs:

ERC8a Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor).

SpERC COLIPA 17-19: Wide Dispersive Use in 'Down the Drain' products - hair and skin care products; Wide Dispersive Use of Aerosol products for hair and skin care (Propellants); Wide Dispersive Use of Aerosol products for hair and skin care (Non-Propellants).

Further explanations:

This emission scenario was based upon CEFIC (European Chemical Industry Council) specific environmental release categories (SpERCs).

For further information on standardized use descriptors see the European Chemical Agency (ECHA) Guidance on information requirements and chemical safety assessment, Chapter R.12: Use descriptor system (http://guidance.echa.europa.eu/docs/guidance_document/information_requirements_r12_en.pdf). For further information on CEFIC (The European Chemical Industry Council) Specific Environmental Release Categories (SpERCs), see http://www.cefic.org/Industry-support/Implementing-reach/Libraries/.

2. Conditions of use affecting exposure

2.1 Control of consumer exposure

General:	Based on current knowledge there are no preparations / formulations which contain this substance in concentrations > 1% (with exception of the use as a laboratory agent) and therefore the life cycle ends after the formulation and industrial use stage. Assessment of uses of this substance in consumer products has not been performed as there were no end products identified which contain more than 1% of this substance.

2.2 Control of environmental exposure

General:	All risk management measures utilised must also comply with all relevant local regulations.
Product characteristics:	Concentration of substance in product: Up to 1%. Physical state: liquid.
Amounts used:	Total annual EU tonnage of all registrants for use in this application: 106 tons/year. Total annual regional tonnage of all registrants for use in this application: 5.6 tons/year. Fraction of the main local source: 0.00075.
Frequency and duration of use:	Emission days: <=365 days/year.
Environmental factors not influenced by risk management:	Flow rate of receiving surface water: >=18,000 m3/day (default). Dilution factor: 10 (freshwater), 100 (seawater).
Other given operational conditions affecting environmental exposure:	Industry category: 5/0: Personal/Domestic use. Use category: 15: Cosmetics. Release fraction to air from process: 1 (ERC8a). Release fraction to wastewater from process: 1 (ERC8a). Release fraction to surface water from process: 0 (EUSES). Release fraction to soil from process: 0 (ERC8a).
Organisational measures to prevent/limit releases from site:	Municipal Sewage Treatment Plant (STP): Yes (freshwater), Yes (marine assessment).
Conditions and measures related to municipal sewage treatment plant:	Size of municipal sewage system/treatment plant: >=2000 m3/day (standard town). Fraction of emissions degraded in STP: Efficiency=86.5%.
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:	Discharge of all wastes to a municipal sewage treatment plant (WWTP); or incineration of all waste. Any wastes and solutions tha contain residues of substance are disposed in accordance to national and international regulations. All risk management measures utilised must also comply with all relevant local regulations.

3. Exposure estimation and reference to its source

Environment

Information for contributing scenario (2): ERC8a

Assessment method: EUSES v2.1.

Exposure estimation:

Compartment	PEC	RCR	Notes
Freshwater	0.0000828 mg/L	0.0345	
Freshwater sediment	0.000762 mg/kg dw	0.0345	
Marine water	0.00000822 mg/L	0.0342	
Marine water sediment	0.0000756 mg/kg dw	0.0342	

Compartment	PEC	RCR	Notes
Soil	0.000086 mg/kg dw	0.0286	
STP	0.000715 mg/L	0.0000942	

RCR=Risk characterization ratio (PEC/PNEC or Exposure estimate/DNEL); PEC=Predicted environmental concentration.

4. Guidance to the Downstream User to evaluate whether he works inside the boundaries set by the ES

Environment:	Concentration of substance in product: Up to 1%. Recommended risk management measure: Discharge of all wastes to a municipal sewage treatment plant (WWTP); or incineration of all waste.