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Product name	DANAFLOAT™ 873	March 2018
Safety data sheet according to EU Reg. 1907/2006 as amended		

SAFETY DATA SHEET



DANAFLOAT™ 873

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

- 1.1. **Product identifier** **DANAFLOAT™ 873**
Contains sodium hydroxide, sodium O,O-diisopropyl dithiophosphate, sodium benzothiazol-2-yl sulphide and sodium O,O-diisobutyl dithiophosphate
- 1.2. **Relevant identified uses of the substance or mixture and uses advised against** Can be used as flotation reagent (flotation collector) only.
- 1.3. **Details of the supplier of the safety data sheet** **CHEMINOVA A/S**, a subsidiary of FMC Corporation
 Thyborønvej 78
 DK-7673 Harbøre
 Denmark
SDS.Ronland@fmc.com
- 1.4. **Emergency telephone number**
Company +45 97 83 53 53 (24 h; for emergencies only)
- Medical emergencies:
- | | |
|-------------------------------------|---|
| Austria: +43 1 406 43 43 | Norway: +47 22 591300 |
| Belgium: +32 70 245 245 | Poland: +48 22 619 66 54 |
| Bulgaria: +359 2 9154 409 | +48 22 619 08 97 |
| Cyprus: 1401 | Portugal: 808 250 143 (in Portugal only) |
| Czech Republic: +420 224 919 293 | +351 21 330 3284 |
| +420 224 915 402 | Romania: +40 21318 3606 |
| Denmark: +45 82 12 12 12 | Slovakia: +421 2 54 77 4 166 |
| France: +33 (0) 1 45 42 59 59 | Slovenia: +386 41 650 500 |
| Finland: +358 9 471 977 | South Africa: +27 83 123 3911 (Bateleur Emergency Response Co.) |
| Greece: 30 210 77 93 777 | Spain: +34 91 562 04 20 |
| Hungary: +36 80 20 11 99 | Sweden: +46 08-331231 |
| Ireland (Republic): +353 1 809 2166 | 112 |
| Italy: +39 02 6610 1029 | Switzerland: 145 |
| Lithuania: +370 523 62052 | Turkey: 114 |
| +370 687 53378 | United Kingdom: 111 |
| Luxembourg: +352 8002 5500 | U.S.A. & Canada: +1 800 / 331-3148 (ProPharma) |
| Netherlands: +31 30 274 88 88 | All other countries: +1 651 / 632-6793 (ProPharma - Collect) |

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SECTION 2: HAZARDS IDENTIFICATION

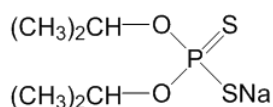
- 2.1. Classification of the substance or mixture**
- Skin corrosion: Category 1C (H314)
 Eye damage: Category 1 (H318)
 Hazards to the aquatic environment, chronic: Category 2 (H411)
- Health hazards The product can have severe irritating effects on skin, eyes, upper digestive tract and respiratory tract.
- Environmental hazards The product may be hazardous in the aquatic environment.
- 2.2. Label elements**
According to EU Reg. 1272/2008 as amended
- Product identifier Danafloat™ 873
 Contains sodium hydroxide, sodium O,O-diisopropyl dithiophosphate, sodium benzothiazol-2-yl sulphide and sodium O,O-diisobutyl dithiophosphate
- Hazard pictograms (GHS05, GHS09)
- 

- Signal word Danger
- Hazard statements
- H314 Causes severe skin burns and eye damage.
 H411 Toxic to aquatic life with long lasting effects.
- Precautionary statements
- P280 Wear protective gloves, protective clothing and eye/face protection.
 P301+P330+P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
 P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
 P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 P310 Immediately call a POISON CENTER or doctor/physician.
 P501 Dispose of contents/container as hazardous waste.
- 2.3. Other hazards** None of the ingredients in the product meets the criteria for being PBT or vPvB.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

- 3.1. Substances** The product is a mixture, not a substance
- 3.2. Mixtures** See section 16 for full text of hazard statements.
- Active ingredients
- i-Propyl-dtp-Na** Content: 23% by weight

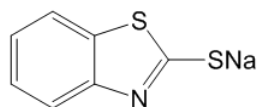
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CAS name Phosphorodithioic acid, O,O-bis(1-methylethyl) ester, sodium salt
 CAS no. 27205-99-8
 IUPAC name Sodium O,O-diisopropyl phosphorodithioate
 EU name Sodium O,O-diisopropyl dithiophosphate
 Other name(s) i-Propyl-dtp-Na
 EC no. (EINECS no.) 248-322-2
 EU index no. None
 Classification of the ingredient Skin corrosion: Category 1C (H314)
 Structural formula

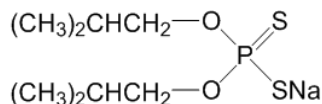


MBT-Na Content: 10% by weight
 CAS name 2(3H)-Benzothiazolethione, sodium salt
 CAS no. 2492-26-4
 EU name Sodium benzothiazole-2-yl sulphide
 Other name(s) Sodium 2-mercaptobenzothiazole
 MBT-Na
 EC no. (EINECS no.) 219-660-8
 EU index no. None
 Classification of the ingredient Skin corrosion: Category 1C (H314)
 Hazards to the aquatic environment, acute: Category 1 (H400)
 chronic, Category 1 (H410)

Structural formula



i-Butyl-dtp-Na Content: 5% by weight
 CAS name Phosphorodithioic acid, O,O-bis(2-methylpropyl) ester, sodium salt
 CAS no. 53378-51-1
 IUPAC name Sodium O,O-diisobutyl phosphorodithioate
 EU name Sodium O,O-diisobutyl dithiophosphate
 Other name(s) i-Butyl-dtp-Na
 EC no. (EINECS no.) 258-508-5
 EU index no. None
 Registration no. 01-2119982402-38-0000
 Classification of the ingredient Skin corrosion: Category 1C (H314)
 Structural formula



Reportable ingredient

	Content (% w/w)	CAS no.	EC no. (EINECS no.)	Classification
Sodium hydroxide Reg. no. 01-2119457892-27	max. 1.5	1310-73-2	215-185-5	Skin Corr. 1A (H314)

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

In case of exposure, do not wait for symptoms to develop.

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Immediately start the recommended procedures below.

Inhalation	If experiencing any discomfort, immediately remove from exposure. Light cases: Keep person under surveillance. Get medical attention immediately if symptoms develop. Serious cases: Get medical attention immediately or call for an ambulance.
Skin contact	Immediately remove contaminated clothing and footwear. Flush skin with much water. Wash with water and soap. See physician immediately if irritation develops.
Eye contact	Immediately rinse eyes with much water or eyewash solution, occasionally opening eyelids. Remove contact lenses after a few minutes and rinse again. See physician immediately. Continue rinsing underway to physician, also if initial pain has subsided.
Ingestion	Let the exposed person rinse mouth and drink several glasses of water or milk, but do not induce vomiting. If vomiting does occur, let him/her rinse mouth and drink fluids again. Never give anything by mouth to an unconscious person. Make the exposed person lie down and keep quiet. Get medical attention immediately.
4.2. Most important symptoms and effects, both acute and delayed	Causes severe irritation/burns to skin and eyes.
4.3. Indication of any immediate medical attention and special treatment needed	In case of eye contact or ingestion call a physician, poison centre or hospital immediately. Describe the type and extent of exposure and the victim's condition.
	It may be helpful to show this safety data sheet to physician.
Note to physician	Irritated skin should be treated as usual against effects of bases (alkali lye) or basic mists. In case lungs are affected watch for pulmonary oedema. Probable mucosal damage may contraindicate the use of gastric lavage.

SECTION 5: FIRE-FIGHTING MEASURES

5.1. Extinguishing media	Dry chemical or carbon dioxide for small fires, water spray or foam for large fires. Avoid heavy hose streams.
5.2. Special hazards arising from the substance or mixture	The essential breakdown products are volatile, toxic, malodorous, irritant and inflammable compounds such as hydrogen sulphide, alkyl mercaptans, dialkyl sulphides, sulphur dioxide, nitrogen oxides, phosphorous pentoxide, carbon monoxide and carbon dioxide.
5.3. Advice for firefighters	Use water spray to keep fire-exposed containers cool. Approach fire from upwind to avoid hazardous vapours and toxic decomposition products. Fight fire from protected location or maximum possible distance. Dike area to prevent water runoff. Firemen should wear self-contained breathing apparatus and protective clothing.

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SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

It is recommended to have a predetermined plan for the handling of spills. Empty, sealable vessels for the collection of spills should be available.

In case of large spill (involving 10 tonnes of the product or more):

1. use personal protection equipment; see section 8
2. call emergency telephone no.; see section 1
3. alert authorities.

Observe all safety precautions when cleaning up spills. Use personal protection equipment. Depending on the magnitude of the spill this may mean wearing respirator, face mask or eye protection, chemical resistant clothing, gloves and rubber boots.

Stop the source of the spill immediately if safe to do so. Keep unprotected persons away from the spill area. Avoid and reduce mist formation as much as possible. Personal exposure by splashing must be avoided.

6.2. Environmental precautions

Contain the spill to prevent any further contamination of surface, soil or water. Wash waters must be prevented from entering surface water drains. Uncontrolled discharge into water courses must be alerted to the appropriate regulatory body.

6.3. Methods and materials for containment and cleaning up

It is recommended to consider possibilities to prevent damaging effects of spills, such as bunding or capping. See GHS (Annex 4, Section 6).

Surface water drains should be covered if appropriate. Minor spills on the floor or other impervious surface should be absorbed onto an absorptive material such as universal binder, bentonite, Fuller's earth or other absorbent clays. Collect the contaminated absorbent in suitable containers. Clean area with much water and industrial detergent. Absorb wash liquid onto absorbent and transfer to suitable containers. The used containers should be properly closed and labelled.

Large spills which soak into the ground should be dug up and transferred to suitable containers.

Spills in water should be contained as much as possible by isolation of the contaminated water. The contaminated water must be collected and removed for treatment or disposal.

6.4. Reference to other sections

See subsection 8.2. for personal protection.
 See section 13 for disposal.

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SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

In an industrial environment, it is recommended to avoid all personal contact with the product, if possible by using closed systems with remote system control. The material should always be handled by mechanical means as much as possible. Adequate ventilation or local exhaust ventilation is required. The exhaust gases should be filtered or treated otherwise.

Remove contaminated clothing immediately. Wash thoroughly after handling. Before removing gloves, wash them with water and soap. After work, take off all work clothes and footwear. Take a shower, using water and soap. Wear only clean clothes when leaving job. Wash protective clothing and protective equipment with water and soap after each use.

Do not discharge to the environment. Collect all waste material and remains from cleaning equipment, etc., and dispose of as hazardous waste. See section 13 for disposal.

7.2. Conditions for safe storage, including any incompatibilities

The product is stable under normal conditions of warehouse storage.

Store in labelled, tightly closed plastic drums or coated steel drums. The storage room should be constructed of incombustible material, closed, dry, ventilated and with impermeable floor, without access of unauthorised persons or children. The room should only be used for storage of chemicals. Food, drink, feed and seed should not be present. A hand wash station should be available.

7.3. Specific end use(s)

Can be used as flotation reagent (flotation collector) only.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Personal exposure limits

To our knowledge, no personal exposure limits have been established for i-propyl-dtp-Na and i-butyl-dtp-Na.

No exposure limit values have been established for MBT-Na, but a MAK-value has been established for 2-mercaptobenzothiazole (MBT):

MBT	Germany, MAK	Year	
		2015	TWA 4 mg/m ³ , inhalable fraction of the aerosol Peak level 4 mg/m ³ Danger of sensitization of the skin
Sodium hydroxide	ACGIH (USA) TLV	2015	CEILING 2 mg/m ³
	OSHA (USA) PEL	2015	8-hr TWA 2 mg/m ³
	EU, 2000/39/EC as amended	2009	Not established

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Germany, MAK 2014 Cannot be established at present
 HSE (UK) WEL 2011 STEL 2 mg/m³, 15 minutes reference period

However, other personal exposure limits defined by local regulations may exist and must be observed.

i-Propyl-dtp-Na Chemical Safety Report is not available.

MBT-Na

DNEL, dermal 2.8 mg/kg bw/day
 DNEL, inhalation 10 mg/m³
 PNEC, freshwater 4.1 µg/l
 PNEC, marine water 0.41 µg/l

i-Butyl-dtp-Na

DNEL, dermal 0.66 mg/kg bw/day
 DNEL, inhalation 2.35 mg/m³
 PNEC, aquatic environment No hazard identified

8.2. Exposure controls When used in a closed system, personal protection equipment will not be required. The following is meant for other situations, when the use of a closed system is not possible, or when it is necessary to open the system. Consider the need to render equipment or piping systems non-hazardous before opening.

In cases of incidental high exposure, maximal personal protection equipment may be necessary, such as respirator, face mask, chemical resistant coveralls.



Respiratory protection

In the event of an accidental discharge of the material which produces a heavy vapour or mist, workers must put on officially approved respiratory protection equipment with a universal filter type including particle filter.



Protective gloves

Wear chemical resistant gloves, such as barrier laminate, butyl rubber or nitrile rubber. The breakthrough time of these materials for this product are unknown. Generally, however, the use of protective gloves will give only partial protection against dermal exposure. Small tears in the gloves and cross-contamination can easily occur. It is recommended to limit the work to be done manually and to change the gloves regularly.



Eye protection

Preferably wear a face shield, rather than goggles or safety glasses. It is recommended to have an eye wash fountain immediately available in the workplace when there is a potential for eye contact.



Other skin protection

Wear appropriate chemical resistant clothing to prevent skin contact depending on the extent of exposure. During most normal work situations where exposure to the material cannot be avoided for a limited time span, waterproof pants and apron of chemical resistant

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material or coveralls of polyethylene (PE) will be sufficient. Coveralls of PE must be discarded after use if contaminated. In cases of excessive or prolonged exposure, coveralls of barrier laminate may be required.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on physical and chemical properties

Appearance	Yellow to brown liquid (solution in water)
Odour	Characteristic odour of sulphur compounds and hydrogen sulphide
Odour threshold	Not determined
pH	Not determined
Melting point/freezing point	Not determined
Initial boiling point and boiling range	Not determined
Flash point	Not determined
Evaporation rate	Not determined
Flammability (solid/gas)	Not applicable (liquid)
Upper/lower flammability or explosive limits	Not determined
Vapour pressure	Not determined
Vapour density	Not determined
Relative density	Not determined
Solubility	Not determined
Partition coefficient n-octanol/water	Not determined; the following number was found by model calculation: i-Propyl-dtp-Na: log K_{ow} = 2.9
Autoignition temperature	Not determined
Decomposition temperature	Not determined
Viscosity	Not determined
Explosive properties	Not explosive
Oxidising properties	Not oxidising

9.2. Other information

Miscibility	The product is miscible with water.
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SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity	To our knowledge, the product has no special reactivities.
10.2. Chemical stability	The product is stable during normal handling and storage at ambient temperatures.
10.3. Possibility of hazardous reactions	None known.
10.4. Conditions to avoid	Heating of the product will evolve harmful and irritant vapours.
10.5. Incompatible materials	None known.
10.6. Hazardous decomposition products	See subsection 5.2.

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SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects * = Based on available data, the classification criteria are not met.

Product

Acute toxicity	The product is not expected to be harmful by single exposure. * The acute toxicity is estimated as:
Route(s) of entry	
- ingestion	LD ₅₀ , oral, rat: > 2000 mg/kg
- skin	LD ₅₀ , dermal, rat: > 2000 mg/kg
- inhalation	LC ₅₀ , inhalation, rat: > 5 mg/l/4 h
Skin corrosion/irritation	Causes severe irritation/burns.
Serious eye damage/irritation	Expected to be severely irritating to eyes with the potential to cause permanent eye damage.
Respiratory or skin sensitisation ...	The product may cause hypersensitivity in certain individuals. *
Germ cell mutagenicity	The product contains no ingredients known to be mutagenic. *
Carcinogenicity	The product contains no ingredients known to be carcinogenic. *
Reproductive toxicity	The product contains no ingredients known to have adverse effects on reproduction. *
STOT – single exposure	To our knowledge, no specific effects after single exposure other than already mentioned have been observed. *
STOT – repeated exposure	The effects of chronic exposure are unknown, but must be expected to be severe.
Aspiration hazard	The product contains no ingredients known to present an aspiration pneumonia hazard. *
Symptoms and effects, acute and delayed	Severe irritation.

Sodium O,O-diisopropyl phosphorodithioate

Acute toxicity	The substance is not expected to be harmful by single exposure, based on comparison to a similar substance. * The acute toxicity is estimated as:
Route(s) of entry	
- ingestion	LD ₅₀ , oral, rat: > 2000 mg/kg
- skin	LD ₅₀ , dermal, rat: > 2000 mg/kg
- inhalation	LC ₅₀ , inhalation, rat: not available
Skin corrosion/irritation	Causes severe irritation/burns to skin.

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Serious eye damage/irritation Causes severe eye damage.

Respiratory or skin sensitisation ... Not expected to cause hypersensitivity. *

Sodium benzothiazol-2-yl sulphide

Acute toxicity The substance is not harmful by ingestion or in contact with skin. *
 The acute toxicity is measured as:

Route(s) of entry	- ingestion	LD ₅₀ , oral, rat: > 2000 mg/kg
	- skin	LD ₅₀ , dermal, rabbit: > 2000 mg/kg
	- inhalation	LC ₅₀ , inhalation, rat: not available

Skin corrosion/irritation Severely irritating to skin.

Serious eye damage/irritation Severely irritating to eyes with the possibility to cause permanent eye damage.

Respiratory or skin sensitisation ... The substance was found not to be allergenic. To our knowledge, no indications of allergenic effects have been reported. * The parent compound 2-mercaptobenzothiazole has allergenic properties.

Sodium O,O-diisobutyl phosphorodithioate

Acute toxicity The substance is not expected to be harmful by single exposure. The acute toxicity is estimated as:

Route(s) of entry	- ingestion	LD ₅₀ , oral, rat: > 2000 mg/kg
	- skin	LD ₅₀ , dermal, rat: > 2000 mg/kg
	- inhalation	LC ₅₀ , inhalation, rat: not available

Skin corrosion/irritation Causes severe irritation/burns.

Serious eye damage/irritation Causes severe eye damage.

Respiratory or skin sensitisation ... Not expected to cause hypersensitivity. *

Sodium hydroxide

Toxicokinetics, metabolism and distribution Both sodium and hydroxide ions are normal body constituents and regulated between narrow ranges. These ranges will not be exceeded, except locally in unusual situations such as accidents.

Acute toxicity No valid studies are available. However, the existing animal and human data on acute toxicity show that sodium hydroxide has a local effect and that systemic effects are not to be expected. *

Skin corrosion/irritation Severely irritating to skin.

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Serious eye damage/irritation Severely irritating to eyes with the possibility to cause permanent eye damage.

Respiratory or skin sensitisation ... To our knowledge, no indications of allergenic properties have been recorded. *

SECTION 12: ECOLOGICAL INFORMATION

12.1. **Toxicity** The product is toxic to fish and other aquatic organisms.

The acute toxicity of MBT-Na is measured as:

- Fish	Rainbow trout (<i>Oncorhynchus mykiss</i>)	96 h-LC ₅₀ : 1.8 mg/l
- Invertebrates	Daphnids (<i>Daphnia magna</i>)	48 h-EC ₅₀ : 19 mg/l
- Algae	Algae cell count	96 h-EC ₅₀ : 0.4 mg/l

12.2. **Persistence and degradability** The product is biodegradable. It undergoes degradation in the environment and in waste water treatment plants.

12.3. **Bioaccumulative potential** See section 9 for octanol-water partition coefficient.
 Bioaccumulation is not expected.

12.4. **Mobility in soil** In the environment, the product is expected to be moderately mobile.

12.5. **Results of PBT and vPvB assessment** None of the ingredients meets the criteria for being PBT or vPvB.

12.6. **Other adverse effects** Other relevant hazardous effects in the environment are not known.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. **Waste treatment methods** Remaining quantities of the material and empty but unclean packaging should be regarded as hazardous waste.

Disposal of waste and packagings must always be in accordance with all applicable local regulations.

Disposal of product According to the Waste Framework Directive (2008/98/EC), possibilities for reuse or reprocessing should first be considered. If this is not feasible, the material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing.

Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

Disposal of packaging It is recommended to consider possible ways of disposal in the following order:

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1. Reuse or recycling should first be considered. If offered for recycling, containers must be emptied and triply rinsed (or equivalent). Do not discharge rinsing water to sewer systems.
2. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.
3. Delivery of the packaging to a licensed service for disposal of hazardous waste.
4. Disposal in a landfill or burning in open air should only occur as a last resort. For disposal in a landfill, containers should be emptied completely, rinsed and punctured to make them unusable for other purposes. If burned, stay out of smoke.

SECTION 14: TRANSPORT INFORMATION

ADR/RID/IMDG/IATA/ICAO classification

- | | |
|--|---|
| 14.1. UN number | 1719 |
| 14.2. UN proper shipping name | Caustic alkali liquid, n.o.s. (sodium hydroxide and sodium 2-mercaptobenzothiazole) |
| 14.3. Transport hazard class(es) | 8 |
| 14.4. Packing group | III |
| 14.5. Environmental hazards | Marine pollutant |
| 14.6. Special precautions for user | Avoid any unnecessary contact with the product. Misuse can result in damage to health. Do not discharge to the environment. |
| 14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code | The product is not transported in bulk by ship. |

SECTION 15: REGULATORY INFORMATION

- | | |
|--|---|
| 15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture | Seveso category (Dir. 2012/18/EU): dangerous for the environment

Young people under the age of 18 are not allowed to work with the product.

All ingredients are covered by EU chemical legislation. |
| 15.2. Chemical safety assessment | Conclusions of the chemical safety assessment have been attached. |

SECTION 16: OTHER INFORMATION

- | | |
|-----------------------------|---|
| List of abbreviations | ACGIH American Conference of Governmental Industrial Hygienists |
| | CAS Chemical Abstracts Service |

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Dir.	Directive
DNEL	Derived No Effect Level
EC	European Community
EC ₅₀	50% Effect Concentration
EINECS	European INventory of Existing Commercial Chemical Substances
GHS	Globally Harmonized classification and labelling System of chemicals, Fifth revised edition 2013
HSE	Health and Safety Executive, UK
IBC	International Bulk Chemical code
IUPAC	International Union of Pure and Applied Chemistry
LC ₅₀	50% Lethal Concentration
LD ₅₀	50% Lethal Dose
MAK	Maximale Arbeitsplatz-Konzentration
MARPOL	Set of rules from the International Maritime Organisation (IMO) for prevention of sea pollution
n.o.s.	Not otherwise specified
OSHA	Occupational Safety and Health Administration
PBT	Persistent, Bioaccumulative, Toxic
PEL	Personal Exposure Limit
PNEC	Predicted No Effect Concentration
Reg.	Registration, or Regulation
STEL	Short-Term Exposure Limit
STOT	Specific Target Organ Toxicity
TLV	Threshold Limit Value
TWA	Time Weighted Average
vPvB	very Persistent, very Bioaccumulative
WEL	Workplace Exposure Limit

References Data on the active ingredients are unpublished company data. Data on other ingredients are available from published literature and can be found several places.

Method for classification Calculation method

Used hazard statements
 H314 Causes severe skin burns and eye damage.
 H318 Causes serious eye damage.
 H400 Very toxic to aquatic life.
 H410 Very toxic to aquatic life with long lasting effects.
 H411 Toxic to aquatic life with long lasting effects.

Advice on training This material should only be used by persons who are made aware of its hazardous properties and have been instructed in the required safety precautions.

The information provided in this safety data sheet is believed to be accurate and reliable, but uses of the product vary and situations unforeseen by FMC Corporation may exist. The user has to check the validity of the information under local circumstances.

Prepared by: FMC Corporation / Cheminova A/S / GHB

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ANNEX: Exposure assessment and related risk characterisation

1. Introduction

1.1. Overview of uses and exposure scenarios

The following table lists all the exposure scenarios (ES).

Table 1. Overview of exposure scenarios and contributing scenarios

Identifiers	Titles of exposure scenarios and the related contributing scenarios	Tonnage (tonnes per year)
ES - IW	Use at industrial site - Use at industrial site - Use at industrial site (ERC 6b) - Worker. Flotation batch process with exposure possible (PROC 5) - Worker. Transfer of substance to flotation process, outdoors (PROC 8b) - Worker. Laboratory analytical work on flotation process (PROC 15)	999.0
IW: Industrial end use at site		

1.2. Introduction to the assessment

1.2.1. Environment

Scope and type of assessment

The scope of exposure assessment and type of risk characterisation required for the environment are described in the following table based on the hazard conclusions presented in the CSR.

Table 2. Type of risk characterisation required for the environment

Protection target	Type of risk characterisation	Hazard conclusion
Freshwater	Quantitative	PNEC aqua (freshwater) = 0.261 mg/L
Sediment (freshwater)	Qualitative	No exposure of sediment expected
Marine water	Quantitative	PNEC aqua (marine water) = 0.026 mg/L
Sediment (marine water)	Qualitative	No exposure of sediment expected
Sewage treatment plant	Not needed	No hazard identified
Air	Not needed	No hazard identified
Agricultural soil	Qualitative	No exposure of soil expected
Predator	Not needed	No potential for bioaccumulation

Comments on assessment approach:

The regional concentrations are reported in the CSR in section 10.2.1.2 (see Table 55, “Predicted regional exposure concentrations (Regional PEC)”). The local Predicted Exposure Concentrations (PECs) reported for each contributing scenario correspond to the sum of the local concentrations (Clocal) and the regional concentrations (PEC regional).

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1.2.2. Man via environment

Scope and type of assessment

The scope of exposure assessment and type of risk characterisation required for man via the environment are described in the following table based on the hazard conclusions reported and justified in the CSR.

Table 3. Type of risk characterisation required for man via the environment

Route of exposure and type of effects	Type of risk characterisation	Hazard conclusion
Inhalation: systemic long-term	Quantitative	DNEL = 0.58 mg/m ³
Oral: systemic long-term	Quantitative	DNEL = 0.33 mg/kg bw/day

1.2.3. Workers

Scope and type of assessment

The scope of exposure assessment and type of risk characterisation required for workers are described in the following table based on the hazard conclusions presented in the CSR.

Table 4. Type of risk characterisation required for workers

Route	Type of effect	Type of risk characterisation	Hazard conclusion
Inhalation	Systemic long-term	Quantitative	DNEL = 2.35 mg/m ³
	Systemic acute	Not needed	No hazard identified
	Local long-term	Qualitative	Medium hazard (no threshold derived)
	Local acute	Qualitative	Medium hazard (no threshold derived)
Dermal	Systemic long-term	Quantitative	DNEL = 0.66 mg/kg bw/day
	Systemic acute	Not needed	No hazard identified
	Local long-term	Qualitative	Medium hazard (no threshold derived)
	Local acute	Qualitative	Medium hazard (no threshold derived)
Eye	Local	Qualitative	Medium hazard (no threshold derived)

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2. Exposure scenario: Use at industrial site

Sector of use: SU 2a, Mining, (without offshore industries)

Environment contributing scenario(s):	
Use at industrial site	ERC 6b
Worker contributing scenario(s):	
Worker. Flotation batch process with exposure possible	PROC 5
Worker. Transfer of substance to flotation process, outdoors	PROC 8b
Worker. Laboratory analytical work on floatation process	PROC 15

2.1. Environmental contributing scenario 1: Use at industrial site

2.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
• Daily use at site: ≤ 3 tonnes/day
• Annual use at a site: ≤ 999 tonnes/year
• Percentage of tonnage used at regional scale: = 100 %
Conditions and measures related to sewage treatment plant
• Municipal STP: no [effectiveness water: 0%] <i>No discharge to waste water treatment plant, all waste are either incinerated or led to holding ponds.</i>
Conditions and measures related to treatment of waste (including article waste)
• Particular considerations on the waste treatment operations: no (low risk) (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure
• Discharge rate of effluent: ≥ 0 m ³ /d
• Receiving surface water flow rate: ≥ 0 m ³ /d

2.1.2. Releases

The local releases to the environment are reported in the following table.

Table 5. Local releases to the environment

Release	Release factor estimation method	Explanation / Justification
Water	Release factor	Initial release factor: 0% Final release factor: 0% Local release rate: 0 kg/day

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Release	Release factor estimation method	Explanation / Justification
Air	Release factor	Initial release factor: 0% Final release factor: 0% Local release rate: 0 kg/day
Soil	Release factor	Final release factor: 0%

2.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 6. Exposure concentrations and risks for the environment

Protection target	Exposure concentration	Risk characterisation
Freshwater	Local PEC: 6.534E-7 mg/L	RCR < 0.01
Sediment (freshwater)		Qualitative risk characterisation (see below)
Marine water	Local PEC: 6.329E-8 mg/L	RCR < 0.01
Sediment (marine water)		Qualitative risk characterisation (see below)
Agricultural soil		Qualitative risk characterisation (see below)
Man via environment - inhalation	Local PEC: 1.071E-12 mg/m³	RCR < 0.01
Man via environment - oral	Exposure via food consumption:	
Man via environment - combined routes		RCR < 0.01

Table 7. Contribution to oral intake for man via the environment from local contribution

Type of food	Estimated daily dose	Concentration in food
Drinking water	9.22E-11 mg/kg bw/day	3.227E-9 mg/L
Fish		
Leaf crops	2.15E-10 mg/kg bw/day	1.254E-8 mg/kg ww
Root crops	2.62E-11 mg/kg bw/day	4.776E-9 mg/kg ww
Meat	5.191E-15 mg/kg bw/day	1.207E-12 mg/kg ww
Milk	6.541E-14 mg/kg bw/day	8.162E-12 mg/kg ww

Conclusion on risk characterisation

There is no exposure to sediment (fresh- and marine water), sewage treatment plant or agricultural soil. Use, transfer and laboratory work does not produce any waste intended to be released into the environment.

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2.2. Worker contributing scenario 1: Worker. Flotation batch process with exposure possible (PROC 5)

2.2.1. Conditions of use

	Method
Amount used (or contained in articles), frequency and duration of use/exposure	
• Concentration of substance in a mixture: < 0.01 % w/w <i>Used as 100 g pr ton ore.</i>	External tool (easyTRA)
• Duration of activity: < 8 hours (avoid carrying out activities involving exposure for more than 8 hours.)	External tool (easyTRA)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: yes (chemically resistant gloves conforming to EN374 with specific activity training) [effectiveness dermal: 95%]	External tool (easyTRA)
Other conditions affecting workers exposure	
• Place of use: outdoor	External tool (easyTRA)

2.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 8. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, systemic, long-term	0.004 mg/m³ (external tool (easyTRA))	RCR < 0.01
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	6.9E-5 mg/kg bw/day (external tool (easyTRA))	RCR < 0.01
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR < 0.01

Conclusion on risk characterisation

The available data material suggests that the dominating local effect upon exposure to the substance, both long- and short term, will be corrosion.

Dermal corrosion is prevented by workers wearing gloves at all times when working with the substance.

Eye corrosion is prevented by workers wearing a face mask/googles/safety glasses at all times when working with the substance.

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Inhalative corrosion is prevented by working under effective local area ventilation systems. The solid substance has a low vapour pressure (below 10 Pa). Furthermore the substance is a salt and additionally it is produced in an aqueous solution. Hence it exists as ions in the solution which further lowers any inhalative exposure below a level, which could give local inhalative corrosion.

The risk management measures mentioned above (gloves, eye protection and LEV) effectively eliminates local effects. Therefore any long- or short-term risks for local effects upon exposure of the substance are controlled.

2.3. Worker contributing scenario 2: Worker. Transfer of substance to flotation process, outdoors (PROC 8b)

2.3.1. Conditions of use

	Method
Amount used (or contained in articles), frequency and duration of use/exposure	
• Concentration of substance in a mixture: 50%	External tool (easyTRA)
• Duration of activity: < 25 minutes	External tool (easyTRA)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: yes (chemically resistant gloves conforming to EN374 with specific activity training) [effectiveness dermal: 95%]	External tool (easyTRA)
Other conditions affecting workers exposure	
• Place of use: outdoor	External tool (easyTRA)

2.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, systemic, long-term	1.003 mg/m³ (external tool (easyTRA))	RCR = 0.427
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	0.018 mg/kg bw/day (external tool (easyTRA))	RCR = 0.027
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.454

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Conclusion on risk characterisation

The available data material suggests that the dominating local effect upon exposure to the substance, both long- and short term, will be corrosion.

Dermal corrosion is prevented by workers wearing gloves at all times when working with the substance.

Eye corrosion is prevented by workers wearing a face mask/googles/safety glasses at all times when working with the substance.

Inhalative corrosion is prevented by working under effective local area ventilation systems. The solid substance has a low vapour pressure (below 10 Pa). Furthermore the substance is a salt and additionally it is produced in an aqueous solution. Hence it exists as ions in the solution which further lowers any inhalative exposure below a level, which could give local inhalative corrosion.

The risk management measures mentioned above (gloves, eye protection and LEV) effectively eliminates local effects. Therefore any long- or short-term risks for local effects upon exposure of the substance are controlled.

2.4. Worker contributing scenario 3: Worker. Laboratory analytical work on floatation process (PROC 15)

2.4.1. Conditions of use

	Method
Amount used (or contained in articles), frequency and duration of use/exposure	
• Concentration of substance in a mixture: < 0.01 % w/w	External tool (easyTRA)
• Duration of activity: < 8 hours (avoid carrying out activities involving exposure for more than 8 hours.)	External tool (easyTRA)
Technical and organisational conditions and measures	
• Laboratory work under fume hood: yes [effectiveness inhalation: 99.99%]	External tool (easyTRA)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: yes (chemically resistant gloves conforming to EN374 with specific activity training) [effectiveness dermal: 95%]	External tool (easyTRA)

2.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 10. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, systemic, long-term	5.5E-7 mg/m³ (external tool (easyTRA))	RCR < 0.01
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)

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Route of exposure and type of effects	Exposure concentration	Risk characterisation
Dermal, systemic, long-term	1.71E-6 mg/kg bw/day (external tool (easyTRA))	RCR < 0.01
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Eye, local		Qualitative (see below)
Combined routes, systemic, long-term		RCR < 0.01

Conclusion on risk characterisation

The available data material suggests that the dominating local effect upon exposure to the substance, both long- and short term, will be corrosion.

Dermal corrosion is prevented by workers wearing gloves at all times when working with the substance.

Eye corrosion is prevented by workers wearing a face mask/googles/safety glasses at all times when working with the substance.

Inhalative corrosion is prevented by working under effective local area ventilation systems. The solid substance has a low vapour pressure (below 10 Pa). Furthermore the substance is a salt and additionally it is produced in an aqueous solution. Hence it exists as ions in the solution which further lowers any inhalative exposure below a level, which could give local inhalative corrosion.

The risk management measures mentioned above (gloves, eye protection and LEV) effectively eliminates local effects. Therefore any long- or short-term risks for local effects upon exposure of the substance are controlled.