

## Safety Data Sheet

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878  
Reference number: MXene-001  
Issue date: 06.03.2023 Version: 1.0

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

#### 1.1. Product identifier

Product form : Substance  
Substance name : Ti<sub>3</sub>C<sub>2</sub>Tx MXene; Titanium Carbide  
CAS-No. : 12363-89-2  
Product code : MXene-001  
Formula : Ti<sub>3</sub>C<sub>2</sub>;Ti<sub>3</sub>C<sub>2</sub>Tx

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

##### 1.2.1. Relevant identified uses

Main use category : Professional use  
Use of the substance/mixture : Laboratory chemicals  
Scientific research and development

##### 1.2.2. Uses advised against

No additional information available

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

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Orta Mah. Üniversite Cad. No: 27/1 34956 Tuzla  
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TÜRKİYE  
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[sunum@sabanciuniv.edu](mailto:sunum@sabanciuniv.edu) - [sunum.sabanciuniv.edu](http://sunum.sabanciuniv.edu)

#### 1.4. Emergency telephone number

Emergency number : +90 (216) 483 9000

### SECTION 2: Hazards identification

#### 2.1. Classification of the substance or mixture

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

Not classified

##### Adverse physicochemical, human health and environmental effects

To our knowledge, this product does not present any particular risk, provided it is handled in accordance with good occupational hygiene and safety practice.

#### 2.2. Label elements

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

No labelling applicable

#### 2.3. Other hazards

Other hazards which do not result in classification : Avoid dust formation. Dust from this product may cause minor eye irritation. Dust of the product, if present, may cause respiratory irritation after an excessive inhalation exposure.

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

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### SECTION 3: Composition/information on ingredients

#### 3.1. Substances

Name : Ti3C2Tx MXene; Titanium Carbide  
CAS-No. : 12363-89-2

Name	Product identifier	Conc. (% w/w)	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Ti3C2Tx MXene; Titanium Carbide	CAS-No.: 12363-89-2	≤ 100	Not classified
Lithium fluoride (Constituent)	CAS-No.: 7789-24-4 EC-No.: 232-152-0	-	Acute Tox. 4 (Oral), H302 Eye Irrit. 2, H319
Titanium aluminium carbide (Constituent)	CAS-No.: 196506-01-1	-	Skin Irrit. 2, H315 Eye Irrit. 2, H319
hydrochloric acid ... % (Constituent) (Note B)	EC-No.: 231-595-7 EC Index-No.: 017-002-01-X	-	Skin Corr. 1B, H314 STOT SE 3, H335

#### Specific concentration limits:

Name	Product identifier	Specific concentration limits
hydrochloric acid ... % (Constituent)	EC-No.: 231-595-7 EC Index-No.: 017-002-01-X	( 10 ≤ C < 100) STOT SE 3, H335 ( 10 ≤ C < 25) Eye Irrit. 2, H319 ( 10 ≤ C < 25) Skin Irrit. 2, H315 ( 25 ≤ C < 100) Skin Corr. 1B, H314

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

Note B: Some substances (acids, bases, etc.) are placed on the market in aqueous solutions at various concentrations and, therefore, these solutions require different classification and labelling since the hazards vary at different concentrations. In Part 3 entries with Note B have a general designation of the following type: '... %'. In this case the supplier must state the percentage concentration of the solution on the label. Unless otherwise stated, it is assumed that the percentage concentration is calculated on a weight/weight basis.

#### 3.2. Mixtures

Not applicable

### SECTION 4: First aid measures

#### 4.1. Description of first aid measures

First-aid measures general : In all cases of doubt, or when symptoms persist, seek medical attention.  
First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. When symptoms occur: go into open air and ventilate suspected area. Give oxygen or artificial respiration if necessary. Call a poison center or a doctor if you feel unwell.  
First-aid measures after skin contact : Remove affected clothing and wash all exposed skin area with mild soap and water, followed by warm water rinse. If skin irritation or rash occurs: Get medical advice/attention.  
First-aid measures after eye contact : Direct contact with the eyes is likely to be irritating. Rinse immediately and thoroughly, pulling the eyelids well away from the eye (15 minutes minimum). Obtain medical attention if pain, blinking or redness persists.  
First-aid measures after ingestion : Never give anything by mouth to an unconscious person. Do not induce vomiting. Call a poison center or a doctor if you feel unwell.

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

Symptoms/effects after inhalation : Dust of the product, if present, may cause respiratory irritation after an excessive inhalation exposure.  
Symptoms/effects after eye contact : Dust from this product may cause minor eye irritation.

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

Treat symptomatically.

## SECTION 5: Firefighting measures

### 5.1. Extinguishing media

Suitable extinguishing media : Water spray. Dry chemical powder, alcohol-resistant foam, carbon dioxide (CO<sub>2</sub>).  
Unsuitable extinguishing media : Do not use a solid water stream as it may scatter and spread fire.

### 5.2. Special hazards arising from the substance or mixture

Fire hazard : The product is not flammable.  
Explosion hazard : Not explosive.  
Hazardous decomposition products in case of fire : On heating or during combustion : Toxic fumes may be released. Carbon oxides (CO, CO<sub>2</sub>).

### 5.3. Advice for firefighters

Precautionary measures fire : Keep away from combustible materials. Keep container closed when not in use. Approach from upwind.  
Firefighting instructions : Exercise caution when fighting any chemical fire. Keep upwind. Do not enter fire area without proper protective equipment, including respiratory protection. Eliminate all ignition sources if safe to do so. Contain the extinguishing fluids by bunding.  
Protection during firefighting : Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.  
Other information : Do not allow run-off from fire fighting to enter drains or water courses. Notify authorities if product enters sewers or public waters. High temperature decomposition products are harmful by inhalation. Inhalation of vapour can cause breathing difficulties.

## SECTION 6: Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

General measures : Avoid all contact with skin, eyes, or clothing. Do not handle until all safety precautions have been read and understood.

#### 6.1.1. For non-emergency personnel

Protective equipment : For further information refer to section 8: "Exposure controls/personal protection".  
Emergency procedures : Ventilate spillage area. Do not touch or walk on the spilled product.  
Measures in case of dust release : In case of excessive dust production. Dust mask. Protective goggles. Dustproof clothing.

#### 6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".  
Emergency procedures : Do not touch spilled material. Evacuate unnecessary personnel. Equip cleanup crew with proper protection. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Stop leak if safe to do so.

### 6.2. Environmental precautions

Avoid release to the environment.

### 6.3. Methods and material for containment and cleaning up

For containment : Do not touch or walk on the spilled product.  
Methods for cleaning up : Take up mechanically (sweeping, shovelling) and collect in suitable container for disposal. Notify authorities if product enters sewers or public waters.  
Other information : Dispose of materials or solid residues at an authorized site.

### 6.4. Reference to other sections

Concerning personal protective equipment to use, see section 8. Concerning disposal elimination after cleaning, see section 13.

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### SECTION 7: Handling and storage

#### 7.1. Precautions for safe handling

Additional hazards when processed	: Ensure good ventilation of the work station.
Precautions for safe handling	: Ensure good ventilation of the work station. Wear personal protective equipment.
Hygiene measures	: Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

#### 7.2. Conditions for safe storage, including any incompatibilities

Technical measures	: Comply with applicable regulations.
Storage conditions	: Keep only in the original container in a cool well ventilated place.
Incompatible products	: Strong acids. Strong bases. Strong oxidizing agents.
Incompatible materials	: Extremely high or low temperatures.
Heat and ignition sources	: Keep away from heat and direct sunlight. Keep away from sources of ignition.
Information on mixed storage	: Keep away from food, drink and animal feeding stuffs.
Storage area	: Store, if possible, in a cool, well ventilated place away from incompatible materials.

#### 7.3. Specific end use(s)

See Section 1.2.

### SECTION 8: Exposure controls/personal protection

#### 8.1. Control parameters

##### 8.1.1 National occupational exposure and biological limit values

hydrochloric acid ... %	
EU - Indicative Occupational Exposure Limit (IOEL)	
Local name	Hydrogen chloride
IOEL TWA	8 mg/m <sup>3</sup>
IOEL TWA [ppm]	5 ppm
IOEL STEL	15 mg/m <sup>3</sup>
IOEL STEL [ppm]	10 ppm
Regulatory reference	COMMISSION DIRECTIVE 2000/39/EC

##### 8.1.2. Recommended monitoring procedures

No additional information available

##### 8.1.3. Air contaminants formed

No additional information available

##### 8.1.4. DNEL and PNEC

No additional information available

##### 8.1.5. Control banding

No additional information available

#### 8.2. Exposure controls

##### 8.2.1. Appropriate engineering controls

###### Appropriate engineering controls:

Ensure good ventilation of the work station.

##### 8.2.2. Personal protection equipment

###### Personal protective equipment:

Gloves. In case of dust production: protective goggles. Dustproof clothing. Dust formation: dust mask.

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### Personal protective equipment symbol(s):



#### 8.2.2.1. Eye and face protection

##### Eye protection:

Avoid contact with eyes. Use eye protection according to EN 166, designed to protect against powders and dusts.

#### 8.2.2.2. Skin protection

##### Skin and body protection:

According to the conditions of use, protective gloves, apron, boots, head and face protection must be worn. EN 13034. EN 14605

##### Hand protection:

Protective gloves. Choosing the proper glove is a decision that depends not only on the type of material, but also on other quality features, which differ for each manufacturer. The breakthrough time of the selected gloves must be greater than the intended use period. Gloves must be replaced after each use and whenever signs of wear or perforation appear. ISO 374-1

#### 8.2.2.3. Respiratory protection

##### Respiratory protection:

In case of insufficient ventilation, wear suitable respiratory equipment. Dust production: dust mask with filter type P2. EN 143. EN 14387

#### 8.2.2.4. Thermal hazards

No additional information available

#### 8.2.3. Environmental exposure controls

##### Environmental exposure controls:

Avoid release to the environment.

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

Physical state	: Solid
Colour	: Black.
Appearance	: Clear.
Odour	: According to product specification.
Odour threshold	: Not available
Melting point	: Not available
Freezing point	: Not applicable
Boiling point	: Not available
Flammability	: Non flammable.
Explosive limits	: Not applicable
Lower explosion limit	: Not applicable
Upper explosion limit	: Not applicable
Flash point	: Not applicable
Auto-ignition temperature	: Not applicable
Decomposition temperature	: Not available
pH	: Not available
pH solution	: Not available
Viscosity, kinematic	: Not applicable
Solubility	: Not available
Partition coefficient n-octanol/water (Log Kow)	: Not available
Vapour pressure	: Not available
Vapour pressure at 50°C	: Not available
Density	: Not available
Relative density	: Not available
Relative vapour density at 20°C	: Not applicable
Particle size	: 0,7 — 4,33 µm (D10 - D90, Titanium carbide, CAS 12070-08-5)

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### 9.2. Other information

#### 9.2.1. Information with regard to physical hazard classes

No additional information available

#### 9.2.2. Other safety characteristics

No additional information available

## SECTION 10: Stability and reactivity

### 10.1. Reactivity

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

### 10.2. Chemical stability

Stable under normal conditions.

### 10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

### 10.4. Conditions to avoid

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

### 10.5. Incompatible materials

Strong acids. Strong bases. Strong oxidizing agents.

### 10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

## SECTION 11: Toxicological information

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

Acute toxicity (oral)	: Not classified (Based on available data, the classification criteria are not met)
Acute toxicity (dermal)	: Not classified (Based on available data, the classification criteria are not met)
Acute toxicity (inhalation)	: Not classified (Based on available data, the classification criteria are not met)

Lithium fluoride (7789-24-4)	
LD50 dermal rat	> 2000 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 402 (Acute Dermal Toxicity), Guideline: EU Method B.3 (Acute Toxicity (Dermal)), Guideline: EPA OPPTS 870.1200 (Acute Dermal Toxicity)
LC50 Inhalation - Rat	> 15,57 mg/l air Animal: rat, Guideline: OECD Guideline 403 (Acute Inhalation Toxicity), Guideline: EU Method B.2 (Acute Toxicity (Inhalation)), Guideline: EPA OPP 81-3 (Acute inhalation toxicity)

Skin corrosion/irritation	: Not classified (Based on available data, the classification criteria are not met)
Serious eye damage/irritation	: Not classified (Based on available data, the classification criteria are not met)
Respiratory or skin sensitisation	: Not classified (Based on available data, the classification criteria are not met)
Germ cell mutagenicity	: Not classified (Based on available data, the classification criteria are not met)
Carcinogenicity	: Not classified (Based on available data, the classification criteria are not met)
Reproductive toxicity	: Not classified (Based on available data, the classification criteria are not met)
STOT-single exposure	: Not classified (Based on available data, the classification criteria are not met)

hydrochloric acid ... %	
STOT-single exposure	May cause respiratory irritation.

STOT-repeated exposure	: Not classified (Based on available data, the classification criteria are not met)
Aspiration hazard	: Not classified (Not relevant)

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Viscosity, kinematic	Not applicable
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#### 11.2. Information on other hazards

No additional information available

## SECTION 12: Ecological information

### 12.1. Toxicity

Ecology - general : The product is not considered harmful to aquatic organisms nor to cause long-term adverse effects in the environment.

Hazardous to the aquatic environment, short-term (acute) : Not classified (Based on available data, the classification criteria are not met)

Hazardous to the aquatic environment, long-term (chronic) : Not classified (Based on available data, the classification criteria are not met)

Not rapidly degradable

### Lithium fluoride (7789-24-4)

LC50 - Fish [1]	158 mg/l Test organisms (species): Oncorhynchus mykiss (previous name: Salmo gairdneri)
EC50 - Crustacea [1]	249 mg/l Test organisms (species): Daphnia magna
EC50 72h - Algae [1]	> 400 mg/l Test organisms (species): Desmodesmus subspicatus (previous name: Scenedesmus subspicatus)
EC50 72h - Algae [2]	112 mg/l Test organisms (species): Desmodesmus subspicatus (previous name: Scenedesmus subspicatus)
LOEC (chronic)	2,53 mg/l Test organisms (species): Daphnia magna Duration: '21 d'
NOEC (chronic)	1,7 mg/l Test organisms (species): Daphnia magna Duration: '21 d'
NOEC chronic fish	17,35 mg/l Test organisms (species): Danio rerio (previous name: Brachydanio rerio) Duration: '34 d'

### 12.2. Persistence and degradability

No additional information available

### 12.3. Bioaccumulative potential

No additional information available

### 12.4. Mobility in soil

No additional information available

### 12.5. Results of PBT and vPvB assessment

No additional information available

### 12.6. Endocrine disrupting properties

No additional information available

### 12.7. Other adverse effects

No additional information available

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### SECTION 13: Disposal considerations

#### 13.1. Waste treatment methods

Regional legislation (waste)	: Disposal must be done according to official regulations.
Waste treatment methods	: Dispose of contents/container in accordance with licensed collector's sorting instructions.
Product/Packaging disposal recommendations	: Completely empty the packaging prior to decontamination. Recycle the material as far as possible. Comply with local regulations for disposal.
Ecology - waste materials	: Avoid release to the environment.

### SECTION 14: Transport information

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

ADR	IMDG	IATA	ADN	RID
<b>14.1. UN number or ID number</b>				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
<b>14.2. UN proper shipping name</b>				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
<b>14.3. Transport hazard class(es)</b>				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
<b>14.4. Packing group</b>				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
<b>14.5. Environmental hazards</b>				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
No supplementary information available				

#### 14.6. Special precautions for user

##### Overland transport

Not regulated

##### Transport by sea

Not regulated

##### Air transport

Not regulated

##### Inland waterway transport

Not regulated

##### Rail transport

Not regulated

#### 14.7. Maritime transport in bulk according to IMO instruments

Not applicable



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### SECTION 15: Regulatory information

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

##### 15.1.1. EU-Regulations

###### REACH Annex XVII (Restriction List)

Not listed on REACH Annex XVII

###### REACH Annex XIV (Authorisation List)

Not listed on REACH Annex XIV (Authorisation List)

###### REACH Candidate List (SVHC)

Not listed on the REACH Candidate List

###### PIC Regulation (Prior Informed Consent)

Not listed on the PIC list (Regulation EU 649/2012)

###### POP Regulation (Persistent Organic Pollutants)

Not listed on the POP list (Regulation EU 2019/1021)

###### Ozone Regulation (1005/2009)

Not listed on the Ozone Depletion list (Regulation EU 1005/2009)

###### Explosives Precursors Regulation (2019/1148)

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

###### Drug Precursors Regulation (273/2004)

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

##### 15.1.2. National regulations

###### France

Occupational diseases	
Code	Description
RG 66	Occupational rhinitis and asthma

###### Germany

Employment restrictions : Observe restrictions according Act on the Protection of Working Mothers (MuSchG).  
Observe restrictions according Act on the Protection of Young People in Employment (JArbSchG).

Water hazard class (WGK) : Not classified according to Regulation Governing Systems for Handling Substances Hazardous to Waters (AwSV).

Storage class (LGK, TRGS 510) : LGK 13 - Non-combustible solids.

Joint storage table

LGK 1	LGK 2A	LGK 2B	LGK 3	LGK 4.1A
LGK 4.1B	LGK 4.2	LGK 4.3	LGK 5.1A	LGK 5.1B
LGK 5.1C	LGK 5.2	LGK 6.1A	LGK 6.1B	LGK 6.1C
LGK 6.1D	LGK 6.2	LGK 7	LGK 8A	LGK 8B
LGK 10	LGK 11	LGK 12	LGK 13	LGK 10-13

Joint storage not permitted for : LGK 1, LGK 6.2, LGK 7.

Joint storage with restrictions permitted for : LGK 4.1A, LGK 5.1C.

Joint storage permitted for : LGK 2A, LGK 2B, LGK 3, LGK 4.1B, LGK 4.2, LGK 4.3, LGK 5.1A, LGK 5.1B, LGK 5.2, LGK 6.1A, LGK 6.1B, LGK 6.1C, LGK 6.1D, LGK 8A, LGK 8B, LGK 10, LGK 11, LGK 12, LGK 13, LGK 10-13.

Hazardous Incident Ordinance (12. BImSchV) : Is not subject of the Hazardous Incident Ordinance (12. BImSchV)

###### Netherlands

ABM category : A(4) - low hazard for aquatic organisms, may have longterm hazardous effects in aquatic environment

SZW-lijst van kankerverwekkende stoffen : The substance is not listed

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SZW-lijst van mutagene stoffen : The substance is not listed  
SZW-lijst van reprotoxische stoffen – Borstvoeding : The substance is not listed  
SZW-lijst van reprotoxische stoffen – Vruchtbaarheid : The substance is not listed  
SZW-lijst van reprotoxische stoffen – Ontwikkeling : The substance is not listed

### 15.2. Chemical safety assessment

No chemical safety assessment has been carried out

## SECTION 16: Other information

### Abbreviations and acronyms:

ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE	Acute Toxicity Estimate
BCF	Bioconcentration factor
BLV	Biological limit value
BOD	Biochemical oxygen demand (BOD)
COD	Chemical oxygen demand (COD)
DMEL	Derived Minimal Effect level
DNEL	Derived-No Effect Level
EC-No.	European Community number
EC50	Median effective concentration
EN	European Standard
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
LC50	Median lethal concentration
LD50	Median lethal dose
LOAEL	Lowest Observed Adverse Effect Level
NOAEC	No-Observed Adverse Effect Concentration
NOAEL	No-Observed Adverse Effect Level
NOEC	No-Observed Effect Concentration
OECD	Organisation for Economic Co-operation and Development
OEL	Occupational Exposure Limit
PBT	Persistent Bioaccumulative Toxic
PNEC	Predicted No-Effect Concentration
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SDS	Safety Data Sheet
STP	Sewage treatment plant
ThOD	Theoretical oxygen demand (ThOD)
TLM	Median Tolerance Limit
VOC	Volatile Organic Compounds

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### Abbreviations and acronyms:

CAS-No.	Chemical Abstract Service number
N.O.S.	Not Otherwise Specified
vPvB	Very Persistent and Very Bioaccumulative

Data sources : ECHA (European Chemicals Agency). Supplier's safety documents.

### Full text of H- and EUH-statements:

Acute Tox. 4 (Oral)	Acute toxicity (oral), Category 4
Eye Irrit. 2	Serious eye damage/eye irritation, Category 2
H302	Harmful if swallowed.
H314	Causes severe skin burns and eye damage.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
Skin Corr. 1B	Skin corrosion/irritation, Category 1, Sub-Category 1B
Skin Irrit. 2	Skin corrosion/irritation, Category 2
STOT SE 3	Specific target organ toxicity – Single exposure, Category 3, Respiratory tract irritation

The classification complies with : ATP 12

Safety Data Sheet (SDS), EU

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