

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

1.1. Product identifier ►

Product form	: Substance (Nanoform)
Trade name	: TUBALL™ All grades are part of one set of nanoform
IUPAC name	: Single wall carbon nanotube
EC-No.	: 943-098-9
CAS-No.	: Not assignet for EU-REACH
REACH registration No.	: 01-2120130006-75-0000

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

1.2.1. Relevant identified uses

Use of the substance/mixture	: The additive used for producing lithium-ion batteries, rubbers, transparent conductive coatings, metal composites and ceramic materials. Used as reinforcing material in plastics. Formulation; Industrial use.
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Title	Use descriptors
Formulation: Formulation in polymers, elastomers and resins (ES Ref.: F-1)	PC32, PC33, PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19, ERC3
Formulation: Formulation in coatings (ES Ref.: F-2)	PC9a, PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19, ERC2
Formulation: Formulation in metal matrix composites (ES Ref.: F-3)	PC0, PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19, ERC3
Formulation: Formulation in ceramic materials (ES Ref.: F-4)	PC0, PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19, ERC3
Formulation: Formulation in lubricants (ES Ref.: F-5)	PC24, PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19, ERC2
Uses at industrial sites: Use of additive in polymers, elastomers and resins to produce articles (ES Ref.: IW-1)	SU5, SU11, SU12, SU20, PC32, PC33, PROC1, PROC2, PROC3, PROC4, PROC6, PROC7, PROC8a, PROC8b, PROC9, PROC14, ERC4, ERC5
Uses at industrial sites: Use of additive in coatings and to produce coated articles (ES Ref.: IW-2)	SU14, SU15, SU16, SU17, SU18, SU20, PC9a, PROC1, PROC2, PROC3, PROC4, PROC6, PROC7, PROC8a, PROC8b, PROC9, PROC10, ERC4, ERC5
Uses at industrial sites: Use of additive in metal composites and to produce metal composites articles (ES Ref.: IW-3)	SU15, SU16, SU17, SU20, PC0, PROC1, PROC2, PROC3, PROC4, PROC6, PROC7, PROC8a, PROC8b, PROC9, ERC4, ERC5
Uses at industrial sites: Use of additive in ceramic materials and to produce ceramic articles (ES Ref.: IW-4)	SU0, SU20, PC0, PROC1, PROC2, PROC3, PROC4, PROC6, PROC7, PROC8a, PROC8b, PROC9, PROC14, ERC4, ERC5
Uses at industrial sites: Use of additive in lubricants (ES Ref.: IW-5)	SU17, PC24, PROC1, PROC2, PROC3, PROC4, PROC6, PROC7, PROC8a, PROC8b, PROC9, PROC17, ERC4
Article service life: Use of polymers, elastomers and resins articles (ES Ref.: SL-1)	PROC21, PROC24, PROC28, AC1, AC2, AC3, AC5, AC10, AC13, ERC10a, ERC11a, ERC12a, ERC12c
Article service life: Use of coated articles (ES Ref.: SL-2)	PROC21, PROC24, PROC28, AC1, AC2, AC7, ERC10a, ERC11a, ERC12a, ERC12c
Article service life: Use of metal composites articles (ES Ref.: SL-3)	PROC21, PROC24, PROC28, AC1, AC2, AC3, AC7, ERC10a, ERC11a, ERC12a, ERC12c

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Title	Use descriptors
Article service life: Use of metal ceramic articles (ES Ref.: SL-4)	PROC21, PROC24, AC0, ERC10a, ERC11a, ERC12a, ERC12c

Full text of use descriptors: see section 16

1.2.2. Uses advised against

No additional information available

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

Supplier

Europe:

OCSiAl Europe S.a.r.l.

L-3364, Leudelange,

1, rue de la Poudrerie,

Grand Duchy of Luxembourg

T +352 27 99 03 73

09.00-17.00 GMT+2

europe@ocsial.com

1.4. Emergency telephone number

EMEA : +44 1865 407333 (English) (Carechem 24)

East/South East Asia : +65 3158 1074 (English, Hindi, Japanese, Korean, Malay, Mandarin) (Carechem 24)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Serious eye damage/eye irritation, Category 2 H319

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

Adverse physicochemical, human health and environmental effects

Causes serious eye irritation.

2.2. Label elements

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

Hazard pictograms (CLP) :



GHS07

Signal word (CLP) :

Warning

Hazard statements (CLP) :

H319 - Causes serious eye irritation.

Precautionary statements (CLP) :

P264 - Wash hands thoroughly after handling.

P280 - Wear eye protection, protective gloves, protective clothing, respiratory protection.

P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337+P313 - If eye irritation persists: Get medical advice/attention.

2.3. Other hazards

Other hazards which do not result in classification : None under normal conditions.

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

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

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SECTION 3: Composition/information on ingredients

3.1. Substances

Substance type : Mono-constituent

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Single wall carbon nanotubes*	(CAS-No.) Not assigned for EU-REACH (EC-No.) 943-098-9 (REACH-No.) 01-2120130006-75-0000	80 – 100	Eye Irrit. 2, H319

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

Comments : * Single wall carbon nanotubes TUBALL™

Additional information – Nanoform ►

Name of (set of) nanoform(s)	Tuball™ - all grades are part of one set of nanoform
Number based particle size distribution	d10 1.2-1.45 nm d50 1.2-1.45 nm d90 1.9-2.2 nm
Particle shape	Elongated tubes
Particle aspect ratio	length to diameter ratio 2000 – 10000:1
Crystallinity	Amorphous
Surface functionalisation/treatment - Process	No. Process - Chemical vapor deposition (CVD)
Specific surface area	300 – 1500 m ² /g
Additional information	G/D range : ≥40 (RAMAN at 532 nm)

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation	: Remove person to fresh air and keep comfortable for breathing.. Get medical attention.
First-aid measures after skin contact	: Take off immediately all contaminated clothing. Wash contaminated clothing before reuse. Wash with plenty of soap and water. Wash skin with plenty of water.
First-aid measures after eye contact	: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
First-aid measures after ingestion	: Rinse mouth out with water. Do not induce vomiting. Get medical attention.

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

Symptoms/effects after eye contact : Eye irritation.

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

Treat symptomatically.

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SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Powder, Alcohol-resistant foam, Water spray, Carbon dioxide (CO₂).
Unsuitable extinguishing media : Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Fire hazard : None known.
Explosion hazard : None known.
Hazardous decomposition products in case of fire : Carbon monoxide. Carbon dioxide.

5.3. Advice for firefighters ►

Protection during firefighting : Full face mask. Positive pressure self-contained breathing apparatus (SCBA). Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment : Wear suitable protective clothing.
Emergency procedures : Ventilate spillage area. Avoid formation of dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Evacuate area.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. Wear suitable protective clothing, gloves and eye/face protection. For further information refer to section 8: "Exposure controls/personal protection".
Emergency procedures : Provide adequate ventilation. Evacuate area. Avoid formation of dust. Avoid contact with skin and eyes.

6.2. Environmental precautions

Do not allow to enter into surface water or drains. Collect contaminated extinguishing water separately and must not enter the sewage system.

6.3. Methods and material for containment and cleaning up ►

For containment : Sweep up, shovel or vacuum. Avoid formation of dust.
Methods for cleaning up : Mechanically recover the product. Use approved industrial vacuum cleaner for removal. Avoid generation and spreading of dust. Collect in closed container and remove to a safe place for disposal by burning.
Other information : Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 8: "Exposure controls/personal protection". For disposal of contaminated materials refer to section 13 : "Disposal considerations".

SECTION 7: Handling and storage

7.1. Precautions for safe handling ►

Additional hazards when processed : None known.
Precautions for safe handling : Ensure good ventilation of the work station. Carry out operations in the open/under local exhaust/ventilation or with respiratory protection. Avoid contact with skin and eyes. Wear personal protective equipment.
Hygiene measures : Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

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7.2. Conditions for safe storage, including any incompatibilities

Technical measures	: Provide adequate ventilation to minimize dust concentrations.
Storage conditions	: Store in dry, well-ventilated area. Store at ambient temperature. Keep container tightly closed.

7.3. Specific end use(s)

See "Safe handling and Use of TUBALL"@ tuball.com

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.1.1 National occupational exposure and biological limit values

No additional information available

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

Single wall carbon nanotubes	
DNEL/DMEL (Workers)	
Acute - systemic effects, dermal	No hazard identified
Acute - systemic effects, inhalation	Low hazard (no threshold identified)
Acute - local effects, dermal	No hazard identified
Acute - local effects, inhalation	Low hazard (no threshold identified)
Long-term - systemic effects, dermal	No hazard identified
Long-term - local effects, dermal	No hazard identified
Long-term - local effects, inhalation	Low hazard (no threshold identified)
DNEL/DMEL (General population)	
Acute - systemic effects, dermal	No hazard identified
Acute - systemic effects, inhalation	Low hazard (no threshold identified)
Acute - systemic effects, oral	No hazard identified
Acute - local effects, dermal	No hazard identified
Acute - local effects, inhalation	No hazard identified
Long-term - systemic effects, dermal	No hazard identified
Long-term - local effects, dermal	No hazard identified
Long-term - local effects, inhalation	No hazard identified
PNEC (Water)	
PNEC aqua (freshwater)	No hazard identified
PNEC aqua (marine water)	No hazard identified
PNEC (Sediment)	
PNEC sediment (freshwater)	No hazard identified
PNEC sediment (marine water)	No hazard identified

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PNEC (Soil)	
PNEC soil	No hazard identified
PNEC (Oral)	
PNEC oral (secondary poisoning)	No potential to cause toxic effects if accumulated (in higher organisms) via the food chain
PNEC (STP)	
PNEC sewage treatment plant	No data available: testing technically not feasible

8.1.5. Control banding

No additional information available

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Appropriate engineering controls:

Provide local exhaust (HEPA14 filter) or general room ventilation.

8.2.2. Personal protection equipment

Personal protective equipment:

2 pairs of gloves. Safety glasses. Protective clothing (non-woven fabric). Dust production: dust mask with filter type P3.

Personal protective equipment symbol(s):



8.2.2.1. Eye and face protection

Eye protection:

Safety glasses with side shields. EN 166

8.2.2.2. Skin protection

Skin and body protection:

Protective clothing (non-woven fabric) (with elasticated cuffs and closed neck). EN 14605

Hand protection:

Chemically resistant protective gloves

Hand protection					
Type	Material	Permeation	Thickness (mm)	Penetration	Standard
Disposable gloves, Reusable gloves	Nitrile rubber (NBR)	2 (> 30 minutes)	≥ 0.11 mm		EN 374-3

8.2.2.3. Respiratory protection

Respiratory protection:

Dust production: dust mask with filter type P3. EN 149

Wear respiratory protection to avoid any contact with the mouth.

8.2.2.4. Thermal hazards

No additional information available

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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	: Powder. Nanomaterial.
Odour	: Odourless.
Odour threshold	: Not available
Melting point	: > 400 °C @ 101325 Pa
Freezing point	: Not applicable
Boiling point	: Not available
Flammability	: Non flammable.
Explosive properties	: Not explosive.
Oxidising properties	: Non oxidizing.
Lower explosion limit	: Not applicable
Upper explosion limit	: Not applicable
Flash point	: Not applicable
Auto-ignition temperature	: > 400 °C @ 101325 Pa
Decomposition temperature	: Not available
pH	: Not available
pH solution	: Not available
Viscosity, kinematic	: Not applicable
Solubility	: Insoluble in: Water, Organic solvents. Water: 1 mg/l at 20 °C
Dissolution rate	: Not available
Partition coefficient n-octanol/water (Log Kow)	: Not available
Dispersion stability	: Not available
Vapour pressure	: Not available
Vapour pressure at 50°C	: Not available
Density	: 1.78 g/cm ³ Type: 'density' Temp.: 25 °C
Relative density	: 1.877 g/cm ³ at 20 °C
Relative vapour density at 20°C	: Not applicable

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Particle size	: See section 3.1
Particle size distribution	: See section 3.1
Particle shape	: See section 3.1
Particle aspect ratio	: See section 3.1
Particle aggregation state	: Bundles of nanotubes
Particle agglomeration state	: Single wall carbon nanotubes are embedded in a matrix
Particle specific surface area	: See section 3.1
Particle dustiness	: 1660 mg/kg (DIRM - Single wall carbon nanotubes)

See section 3 for more information about nano properties.

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

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SECTION 10: Stability and reactivity

10.1. Reactivity

Stable under normal conditions.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

None known.

10.4. Conditions to avoid

None known.

10.5. Incompatible materials

Strong oxidizing agents.

10.6. Hazardous decomposition products

Thermal combustion may release carbon monoxide and dioxide.

SECTION 11: Toxicological information

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

Acute toxicity (oral)	: Not classified.
Acute toxicity (dermal)	: Not classified.
Acute toxicity (inhalation)	: Not classified. Technically not feasible
Skin corrosion/irritation	: Not classified. (OECD 431. OECD 439)
Serious eye damage/irritation	: Causes serious eye irritation. (OECD 492)
Respiratory or skin sensitisation	: Not classified. (OECD 429)
Germ cell mutagenicity	: Not classified. (AMES test)
Carcinogenicity	: Not classified.
Reproductive toxicity	: Not classified.

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NOAEL (animal/female, F0/P)	no adverse effects seen at highest dose tested > 1000 mg/kg bw/day - OECD 422
NOAEL (animal, F1)	> 1000 mg/kg bw/day - for adverse effects on prenatal development (conceptus to birth) - OECD 422
NOAEL (animal, F1)	> 1000 mg/kg bw/day - for adverse effects on postnatal development (pup) - OECD 422
STOT-single exposure	: Not classified.
STOT-repeated exposure	: Not classified.

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NOAEL (oral, rat, 90 days)	no adverse effects seen at highest dose tested > 1000 mg/kg bodyweight/day - OECD 422
Aspiration hazard	: Not classified.

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

11.2.1. Endocrine disrupting properties

Adverse health effects caused by endocrine disrupting properties : No additional information available

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11.2.2. Other information

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. (OECD 201. OECD 202)
Hazardous to the aquatic environment, long-term (chronic) : Not classified.
Not rapidly degradable

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

Single wall carbon nanotubes

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

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

12.6. Endocrine disrupting properties ►

Adverse effects on the environment caused by endocrine disrupting properties : No additional information available

12.7. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Regional legislation (waste) : Dispose of this material and its container at hazardous or special waste collection point.
Waste treatment methods : Disposal through controlled incineration or authorised waste dump.
Sewage disposal recommendations : Prevent entry to sewers and public waters.
Product/Packaging disposal recommendations : Dispose of contents/container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation.
Additional information : Clean up even minor leaks or spills if possible without unnecessary risk.
European List of Waste (LoW) code : 06 13 99 - wastes not otherwise specified

SECTION 14: Transport information

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

ADR	IMDG	IATA	ADN	RID
14.1. UN number or ID number				
Not regulated for transport				

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ADR	IMDG	IATA	ADN	RID
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
14.2. UN proper shipping name				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
14.3. Transport hazard class(es)				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
14.4. Packing group				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
14.5. Environmental hazards				
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

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)

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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

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) : WGK nwg, Non-hazardous to water.
- Hazardous Incident Ordinance (12. BImSchV) : Is not subject of the Hazardous Incident Ordinance (12. BImSchV)

Netherlands

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

Denmark

- Danish National Regulations : Young people below the age of 18 years are not allowed to use the product

15.2. Chemical safety assessment

A chemical safety assessment has been carried out

SECTION 16: Other information

Abbreviations and acronyms:

CLP	Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
WGK	Water Hazard Class
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

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Abbreviations and acronyms:	
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
CAS-No.	Chemical Abstract Service number
N.O.S.	Not Otherwise Specified
vPvB	Very Persistent and Very Bioaccumulative
ED	Endocrine disrupting properties

Full text of H- and EUH-statements:	
Eye Irrit. 2	Serious eye damage/eye irritation, Category 2
H319	Causes serious eye irritation.

Full text of use descriptors	
AC0	Other
AC1	Vehicles
AC10	Rubber articles
AC13	Plastic articles
AC2	Machinery, mechanical appliances, electrical/electronic articles
AC3	Electrical batteries and accumulators
AC5	Fabrics, textiles and apparel
AC7	Metal articles
ERC10a	Widespread use of articles with low release (outdoor)
ERC11a	Widespread use of articles with low release (indoor)
ERC12a	Processing of articles at industrial sites with low release
ERC12c	Use of articles at industrial sites with low release
ERC2	Formulation into mixture

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Full text of use descriptors	
ERC3	Formulation into solid matrix
ERC4	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC5	Use at industrial site leading to inclusion into/onto article
PC0	Other
PC24	Lubricants, greases, release products
PC32	Polymer preparations and compounds
PC33	Semiconductors
PC9a	Coatings and paints, thinners, paint removers
PROC1	Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
PROC10	Roller application or brushing
PROC14	Tabletting, compression, extrusion, pelettisation, granulation
PROC17	Lubrication at high energy conditions in metal working operations
PROC19	Manual activities involving hand contact
PROC2	Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
PROC21	Low energy manipulation and handling of substances bound in/on materials or articles
PROC24	High (mechanical) energy work-up of substances bound in /on materials and/or articles
PROC28	Manual maintenance (cleaning and repair) of machinery
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
PROC6	Calendering operations
PROC7	Industrial spraying
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
SU0	Other
SU11	Manufacture of rubber products
SU12	Manufacture of plastics products, including compounding and conversion
SU14	Manufacture of basic metals, including alloys
SU15	Manufacture of fabricated metal products, except machinery and equipment
SU16	Manufacture of computer, electronic and optical products, electrical equipment
SU17	General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment
SU18	Manufacture of furniture
SU20	Health services
SU5	Manufacture of textiles, leather, fur

The classification complies with

: ATP 12

Revision

: All recent revision(s) are noted by a bold triangle pointed to right '►'.

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Disclaimer : This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product. It is the user's responsibility to take mentioned precaution measures and ensure that this information is complete and sufficient for the use of this product.

Safety Data Sheet (SDS), EU

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

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Annex to the safety data sheet

Identified Uses	Es N°	Short title	Page
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Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

1. F-1 - Formulation: Formulation in polymers, elastomers and resins

1.1. Title section

Formulation: Formulation in polymers, elastomers and resins

ES Ref.: F-1

ES Type: Worker

Version: 2.0

Issue date: 10/01/2022

Environment	Use descriptors
Contributing scenario controlling environmental exposure	ERC3

Worker	Use descriptors
Contributing scenario controlling worker exposure	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19, PC32, PC33

Comment	Technical function of the substance: conductive agent; flame retardant; used to improve mechanical, electrical and thermal conductivity and to impart wear resistance.
Processes, tasks, activities covered	Additive blended into various polymers, resins and elastomers. Blending may involve various binders and fillers. Formulation
Assessment method	Qualitative approach used to conclude safe use

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC3)

ERC3	Formulation into solid matrix
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)

Annual site tonnage	≤ 100 t/yr
Maximum daily site tonnage	476 kg/day
	210 days/yr

Technical and organisational conditions and measures

Onsite wastewater treatment required	Adoption of adsorption filters/flocculation units
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	

Conditions and measures related to sewage treatment plant

Municipal Sewage treatment plant	
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Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations

Other conditions affecting environmental exposure

Water-based process, Wastewater emissions generated from equipment cleaning with water

1.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19)

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
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC19	Manual activities involving hand contact

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

Sealing	
Local exhaust ventilation	
Clear spills immediately	
Ensure regular inspection, cleaning and maintenance of equipment and machines	
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed	

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

Assumes a good basic standard of occupational hygiene is implemented

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately.
Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Avoid direct eye contact with product, also via contamination on hands

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

1.3. Exposure estimation and reference to its source

1.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC3)

Information for contributing exposure scenario

Qualitative Chemical Risk Assessment for the Environment

The main source of release of Single-Walled Carbon Nanotubes (SWCNT) to the environment is production as such (concentration 100%), whereas in once formulated into articles, its concentration is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant.

Currently, no hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. On the basis of currently available information on physico-chemical properties, environmental fate and behaviour, ecotoxicity and toxicity to humans, the substance has been assessed not to be a PBT or vPvB. In addition, the substance is not legally classified as 'dangerous for the environment' according to Table 3.1 of regulation (EC) No 1272/2008. Consequently, according to REACH regulation (EC) No 1907/2006, Article 14.4, an exposure assessment and risk characterisation for the environment, addressing quantitatively all identified uses of the registrant, is not required

1.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

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

1.4.1. Environment

Guidance - Environment

No hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. Risk Management Measures are based on qualitative risk characterisation

1.4.2. Health

Guidance - Health

Risk Management Measures are based on qualitative risk characterisation

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

2. F-2 - Formulation: Formulation in coatings

2.1. Title section

Formulation: Formulation in coatings

ES Ref.: F-2

ES Type: Worker

Version: 2.0

Issue date: 10/01/2022

Environment	Use descriptors
Contributing scenario controlling environmental exposure	ERC2

Worker	Use descriptors
Contributing scenario controlling worker exposure	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19, PC9a

Comment	Technical function of the substance: corrosion inhibitor; durability agent; used to improve conductivity and abrasion resistance, used as conductive primer
Processes, tasks, activities covered	Additive blended into various coatings. Blend or dispersion may involve various binders, fillers and inks. Formulation
Assessment method	Qualitative approach used to conclude safe use

2.2. Conditions of use affecting exposure

2.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC2)

ERC2	Formulation into mixture
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)

Annual site tonnage	≤ 100 t/yr
Maximum daily site tonnage	476 kg/day
	210 days/yr

Technical and organisational conditions and measures

Onsite wastewater treatment required	Adoptation of adsorption filters/flocculation units
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	

Conditions and measures related to sewage treatment plant

Municipal Sewage treatment plant	
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Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations

Other conditions affecting environmental exposure

Water-based process, Wastewater emissions generated from equipment cleaning with water

2.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19)

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
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC19	Manual activities involving hand contact

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

Sealing	
Local exhaust ventilation	
Clear spills immediately	
Ensure regular inspection, cleaning and maintenance of equipment and machines	
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed	

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

Assumes a good basic standard of occupational hygiene is implemented

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear 2 pair of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Avoid direct eye contact with product, also via contamination on hands

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

2.3. Exposure estimation and reference to its source

2.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC2)

Information for contributing exposure scenario

Qualitative Chemical Risk Assessment for the Environment

The main source of release of Single-Walled Carbon Nanotubes (SWCNT) to the environment is production as such (concentration 100%), whereas in once formulated into articles, its concentration is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant.

Currently, no hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. On the basis of currently available information on physico-chemical properties, environmental fate and behaviour, ecotoxicity and toxicity to humans, the substance has been assessed not to be a PBT or vPvB. In addition, the substance is not legally classified as 'dangerous for the environment' according to Table 3.1 of regulation (EC) No 1272/2008. Consequently, according to REACH regulation (EC) No 1907/2006, Article 14.4, an exposure assessment and risk characterisation for the environment, addressing quantitatively all identified uses of the registrant, is not required

2.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

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

2.4.1. Environment

Guidance - Environment

No hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. Risk Management Measures are based on qualitative risk characterisation

2.4.2. Health

Guidance - Health

Risk Management Measures are based on qualitative risk characterisation

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

3. F-3 - Formulation: Formulation in metal matrix composites

3.1. Title section

Formulation: Formulation in metal matrix composites

ES Ref.: F-3

ES Type: Worker

Version: 2.0

Issue date: 10/01/2022

Environment		Use descriptors
	Contributing scenario controlling environmental exposure	ERC3

Worker		Use descriptors
	Contributing scenario controlling worker exposure	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19,PC0

Comment	Technical function of the substance: tensile strenght and thermal creep resistance	
Processes, tasks, activities covered	Additive blended with metals Formulation	
Assessment method	Qualitative approach used to conclude safe use	

3.2. Conditions of use affecting exposure

3.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC3)

ERC3	Formulation into solid matrix
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)

Annual site tonnage	≤ 100 t/yr
Maximum daily site tonnage	476 kg/day
	210 days/yr

Technical and organisational conditions and measures

Onsite wastewater treatment required	Adoptation of adsorption filters/flocculation units
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	

Conditions and measures related to sewage treatment plant

Municipal Sewage treatment plant	
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Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations

Other conditions affecting environmental exposure

Water-based process, Wastewater emissions generated from equipment cleaning with water

3.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19)

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
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC19	Manual activities involving hand contact

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

Sealing	
Local exhaust ventilation	
Clear spills immediately	
Ensure regular inspection, cleaning and maintenance of equipment and machines	
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed	

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

Assumes a good basic standard of occupational hygiene is implemented

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately.
Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Avoid direct eye contact with product, also via contamination on hands

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

3.3. Exposure estimation and reference to its source

3.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC3)

Information for contributing exposure scenario

Qualitative Chemical Risk Assessment for the Environment

The main source of release of Single-Walled Carbon Nanotubes (SWCNT) to the environment is production as such (concentration 100%), whereas in once formulated into articles, its concentration is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant.

Currently, no hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. On the basis of currently available information on physico-chemical properties, environmental fate and behaviour, ecotoxicity and toxicity to humans, the substance has been assessed not to be a PBT or vPvB. In addition, the substance is not legally classified as 'dangerous for the environment' according to Table 3.1 of regulation (EC) No 1272/2008. Consequently, according to REACH regulation (EC) No 1907/2006, Article 14.4, an exposure assessment and risk characterisation for the environment, addressing quantitatively all identified uses of the registrant, is not required

3.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

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

3.4.1. Environment

Guidance - Environment

No hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. Risk Management Measures are based on qualitative risk characterisation

3.4.2. Health

Guidance - Health

Risk Management Measures are based on qualitative risk characterisation

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

4. F-4 - Formulation: Formulation in ceramic materials

4.1. Title section

Formulation: Formulation in ceramic materials

ES Ref.: F-4

ES Type: Worker

Version: 2.0

Issue date: 10/01/2022

Environment	Use descriptors
Contributing scenario controlling environmental exposure	ERC3

Worker	Use descriptors
Contributing scenario controlling worker exposure	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19, PC0

Comment	Technical function of the substance: strengthening agent
Processes, tasks, activities covered	Additive blended with various ceramic materials and/or resins Formulation
Assessment method	Qualitative approach used to conclude safe use

4.2. Conditions of use affecting exposure

4.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC3)

ERC3	Formulation into solid matrix
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)

Annual site tonnage	≤ 100 t/yr
Maximum daily site tonnage	476 kg/day
	210 days/yr

Technical and organisational conditions and measures

Onsite wastewater treatment required	Adoptation of adsorption filters/flocculation units
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	

Conditions and measures related to sewage treatment plant

Municipal Sewage treatment plant	
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Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations

Other conditions affecting environmental exposure

Water-based process, Wastewater emissions generated from equipment cleaning with water

4.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19)

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
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC19	Manual activities involving hand contact

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

Sealing	
Local exhaust ventilation	
Clear spills immediately	
Ensure regular inspection, cleaning and maintenance of equipment and machines	
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed	

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

Assumes a good basic standard of occupational hygiene is implemented

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately.
Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Avoid direct eye contact with product, also via contamination on hands

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

4.3. Exposure estimation and reference to its source

4.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC3)

Information for contributing exposure scenario

Qualitative Chemical Risk Assessment for the Environment

The main source of release of Single-Walled Carbon Nanotubes (SWCNT) to the environment is production as such (concentration 100%), whereas in once formulated into articles, its concentration is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant.

Currently, no hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. On the basis of currently available information on physico-chemical properties, environmental fate and behaviour, ecotoxicity and toxicity to humans, the substance has been assessed not to be a PBT or vPvB. In addition, the substance is not legally classified as 'dangerous for the environment' according to Table 3.1 of regulation (EC) No 1272/2008. Consequently, according to REACH regulation (EC) No 1907/2006, Article 14.4, an exposure assessment and risk characterisation for the environment, addressing quantitatively all identified uses of the registrant, is not required

4.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

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

4.4.1. Environment

Guidance - Environment

No hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. Risk Management Measures are based on qualitative risk characterisation

4.4.2. Health

Guidance - Health

Risk Management Measures are based on qualitative risk characterisation

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

5. F-5 - Formulation: Formulation in lubricants

5.1. Title section

Formulation: Formulation in lubricants

ES Ref.: F-5

ES Type: Worker

Version: 2.0

Issue date: 10/01/2022

Environment	Use descriptors
Contributing scenario controlling environmental exposure	ERC2

Worker	Use descriptors
Contributing scenario controlling worker exposure	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19, PC24

Comment	Technical function of the substance: used to improve mechanical resistance
Processes, tasks, activities covered	Additive for lubricants Formulation
Assessment method	Qualitative approach used to conclude safe use

5.2. Conditions of use affecting exposure

5.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC2)

ERC2	Formulation into mixture
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)

Annual site tonnage	≤ 100 t/yr
Maximum daily site tonnage	476 kg/day
	210 days/yr

Technical and organisational conditions and measures

Onsite wastewater treatment required	Adoptation of adsorption filters/flocculation units
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	

Conditions and measures related to sewage treatment plant

Municipal Sewage treatment plant	
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Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations

Other conditions affecting environmental exposure

Water-based process, Wastewater emissions generated from equipment cleaning with water

5.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19)

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
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC19	Manual activities involving hand contact

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

Sealing	
Local exhaust ventilation	
Clear spills immediately	
Ensure regular inspection, cleaning and maintenance of equipment and machines	
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed	

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

Assumes a good basic standard of occupational hygiene is implemented

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately.
Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Avoid direct eye contact with product, also via contamination on hands

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

5.3. Exposure estimation and reference to its source

5.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC2)

Information for contributing exposure scenario

Qualitative Chemical Risk Assessment for the Environment

The main source of release of Single-Walled Carbon Nanotubes (SWCNT) to the environment is production as such (concentration 100%), whereas in once formulated into articles, its concentration is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant.

Currently, no hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. On the basis of currently available information on physico-chemical properties, environmental fate and behaviour, ecotoxicity and toxicity to humans, the substance has been assessed not to be a PBT or vPvB. In addition, the substance is not legally classified as 'dangerous for the environment' according to Table 3.1 of regulation (EC) No 1272/2008. Consequently, according to REACH regulation (EC) No 1907/2006, Article 14.4, an exposure assessment and risk characterisation for the environment, addressing quantitatively all identified uses of the registrant, is not required

5.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

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

5.4.1. Environment

Guidance - Environment

No hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. Risk Management Measures are based on qualitative risk characterisation

5.4.2. Health

Guidance - Health

Risk Management Measures are based on qualitative risk characterisation

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

6. IW-1 - Uses at industrial sites: Use of additive in polymers, elastomers and resins to produce articles

6.1. Title section

Uses at industrial sites: Use of additive in polymers, elastomers and resins to produce articles

ES Ref.: IW-1

ES Type: Worker

Version: 2.0

Issue date: 10/01/2022

Environment		Use descriptors
	Contributing scenario controlling environmental exposure	ERC4, ERC5

Worker		Use descriptors
	Contributing scenario controlling worker exposure	PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9, PROC14, PC32, PC33 SU5, SU11, SU12, SU20
	Contributing scenario controlling worker exposure	PROC7

Comment	Technical function of the substance: conductive agent; flame retardant; used to improve mechanical, electrical and thermal conductivity and to impart wear resistance.
Processes, tasks, activities covered	Industrial use
Assessment method	Qualitative approach used to conclude safe use

6.2. Conditions of use affecting exposure

6.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC4, ERC5)

ERC4	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC5	Use at industrial site leading to inclusion into/onto article
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics	
Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage	≤ 100 t/yr
Maximum daily site tonnage	476 kg/day
	210 days/yr

Technical and organisational conditions and measures	
Onsite wastewater treatment required	Adoptation of adsorption filters/flocculation units
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Conditions and measures related to sewage treatment plant

Municipal Sewage treatment plant

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations

Other conditions affecting environmental exposure

Water-based process, Wastewater emissions generated from equipment cleaning with water

6.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9, PROC14)

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
PROC6	Calendering operations
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC14	Tableting, compression, extrusion, pelettisation, granulation

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

Sealing	
Local exhaust ventilation	
Clear spills immediately	
Ensure regular inspection, cleaning and maintenance of equipment and machines	
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed	

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

Assumes a good basic standard of occupational hygiene is implemented

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately.
Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Avoid direct eye contact with product, also via contamination on hands

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

6.2.3. Control of worker exposure: Contributing scenario controlling worker exposure (PROC7)

PROC7

Industrial spraying

Product (article) characteristics

Physical form of product

Solid, low dustiness

Concentration of substance in product

≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

≤ 100 t/yr

≤ 8 h/day

Technical and organisational conditions and measures

Sealing

Spraying or fogging

Ensure that a spraying booth is used

Local exhaust ventilation

Clear spills immediately

Ensure regular inspection, cleaning and maintenance of equipment and machines

Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed

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

Where activities may lead to aerosol release e.g. spraying, then additional skin and eye protection measures such as impervious suits and face shields may be required

Assumes a good basic standard of occupational hygiene is implemented

Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately.
Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Avoid direct eye contact with product, also via contamination on hands

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

6.3. Exposure estimation and reference to its source

6.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC4, ERC5)

Information for contributing exposure scenario

Qualitative Chemical Risk Assessment for the Environment

The main source of release of Single-Walled Carbon Nanotubes (SWCNT) to the environment is production as such (concentration 100%), whereas in once formulated into articles, its concentration is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant.

Currently, no hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. On the basis of currently available information on physico-chemical properties, environmental fate and behaviour, ecotoxicity and toxicity to humans, the substance has been assessed not to be a PBT or vPvB. In addition, the substance is not legally classified as 'dangerous for the environment' according to Table 3.1 of regulation (EC) No 1272/2008. Consequently, according to REACH regulation (EC) No 1907/2006, Article 14.4, an exposure assessment and risk characterisation for the environment, addressing quantitatively all identified uses of the registrant, is not required

6.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9, PROC14)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

6.3.3. Worker exposure Contributing scenario controlling worker exposure (PROC7)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

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

6.4.1. Environment

Guidance - Environment

No hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. Risk Management Measures are based on qualitative risk characterisation

6.4.2. Health

Guidance - Health

Risk Management Measures are based on qualitative risk characterisation

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

7. IW-2 - Uses at industrial sites: Use of additive in coatings and to produce coated articles

7.1. Title section

Uses at industrial sites: Use of additive in coatings and to produce coated articles

ES Ref.: IW-2 ES Type: Worker Version: 2.0	Issue date: 10/01/2022
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Environment	Use descriptors
Contributing scenario controlling environmental exposure	ERC4, ERC5

Worker	Use descriptors
Contributing scenario controlling worker exposure	PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9, PROC10, PC9a SU14, SU15, SU16, SU17, SU18, SU20
Contributing scenario controlling worker exposure	PROC7

Comment	Technical function of the substance: corrosion inhibitor; durability agent; used to improve conductivity and abrasion resistance, used as conductive primer
Processes, tasks, activities covered	Industrial use
Assessment method	Qualitative approach used to conclude safe use

7.2. Conditions of use affecting exposure

7.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC4, ERC5)

ERC4	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC5	Use at industrial site leading to inclusion into/onto article
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)

Annual site tonnage	≤ 100 t/yr
Maximum daily site tonnage	476 kg/day
	210 days/yr

Technical and organisational conditions and measures

Onsite wastewater treatment required	Adoptation of adsorption filters/flocculation units
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Conditions and measures related to sewage treatment plant

Municipal Sewage treatment plant

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations

Other conditions affecting environmental exposure

Water-based process, Wastewater emissions generated from equipment cleaning with water

7.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9, PROC10)

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
PROC6	Calendering operations
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC10	Roller application or brushing

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

Sealing	
Local exhaust ventilation	
Clear spills immediately	
Ensure regular inspection, cleaning and maintenance of equipment and machines	
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed	

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

Assumes a good basic standard of occupational hygiene is implemented

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately.
Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Avoid direct eye contact with product, also via contamination on hands

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

7.2.3. Control of worker exposure: Contributing scenario controlling worker exposure (PROC7)

PROC7

Industrial spraying

Product (article) characteristics

Physical form of product

Solid, low dustiness

Concentration of substance in product

≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

≤ 100 t/yr

≤ 8 h/day

Technical and organisational conditions and measures

Sealing

Local exhaust ventilation

Spraying or fogging

Ensure that a spraying booth is used

Clear spills immediately

Ensure regular inspection, cleaning and maintenance of equipment and machines

Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed

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

Assumes a good basic standard of occupational hygiene is implemented

Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately.
Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Avoid direct eye contact with product, also via contamination on hands

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Where activities may lead to aerosol release e.g. spraying, then additional skin and eye protection measures such as impervious suits and face shields may be required

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

7.3. Exposure estimation and reference to its source

7.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC4, ERC5)

Information for contributing exposure scenario

Qualitative Chemical Risk Assessment for the Environment

The main source of release of Single-Walled Carbon Nanotubes (SWCNT) to the environment is production as such (concentration 100%), whereas in once formulated into articles, its concentration is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant.

Currently, no hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. On the basis of currently available information on physico-chemical properties, environmental fate and behaviour, ecotoxicity and toxicity to humans, the substance has been assessed not to be a PBT or vPvB. In addition, the substance is not legally classified as 'dangerous for the environment' according to Table 3.1 of regulation (EC) No 1272/2008. Consequently, according to REACH regulation (EC) No 1907/2006, Article 14.4, an exposure assessment and risk characterisation for the environment, addressing quantitatively all identified uses of the registrant, is not required

7.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9, PROC10)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

7.3.3. Worker exposure Contributing scenario controlling worker exposure (PROC7)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

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

7.4.1. Environment

Guidance - Environment

No hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. Risk Management Measures are based on qualitative risk characterisation

7.4.2. Health

Guidance - Health

Risk Management Measures are based on qualitative risk characterisation

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

8. IW-3 - Uses at industrial sites: Use of additive in metal composites and to produce metal composites articles

8.1. Title section

Uses at industrial sites: Use of additive in metal composites and to produce metal composites articles

ES Ref.: IW-3

ES Type: Worker

Version: 2.0

Issue date: 10/01/2022

Environment	Use descriptors
Contributing scenario controlling environmental exposure	ERC4, ERC5

Worker	Use descriptors
Contributing scenario controlling worker exposure	PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9 PC0 SU15, SU16, SU17, SU20
Contributing scenario controlling worker exposure	PROC7

Comment	Technical function of the substance: tensile strenght and thermal creep resistance
Processes, tasks, activities covered	Industrial use
Assessment method	Qualitative approach used to conclude safe use

8.2. Conditions of use affecting exposure

8.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC4, ERC5)

ERC4	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC5	Use at industrial site leading to inclusion into/onto article
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics	
Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)	
Annual site tonnage	≤ 100 t/yr
Maximum daily site tonnage	476 kg/day
	210 days/yr

Technical and organisational conditions and measures	
Onsite wastewater treatment required	Adoptation of adsorption filters/flocculation units
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Conditions and measures related to sewage treatment plant

Municipal Sewage treatment plant

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations

Other conditions affecting environmental exposure

Water-based process, Wastewater emissions generated from equipment cleaning with water

8.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9)

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
PROC6	Calendering operations
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

Sealing	
Local exhaust ventilation	
Clear spills immediately	
Ensure regular inspection, cleaning and maintenance of equipment and machines	
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed	

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

Assumes a good basic standard of occupational hygiene is implemented

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately.
Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Avoid direct eye contact with product, also via contamination on hands

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

8.2.3. Control of worker exposure: Contributing scenario controlling worker exposure (PROC7)

PROC7

Industrial spraying

Product (article) characteristics

Physical form of product

Solid, low dustiness

Concentration of substance in product

≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

≤ 100 t/yr

≤ 8 h/day

Technical and organisational conditions and measures

Sealing

Local exhaust ventilation

Spraying or fogging

Ensure that a spraying booth is used

Clear spills immediately

Ensure regular inspection, cleaning and maintenance of equipment and machines

Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed

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

Assumes a good basic standard of occupational hygiene is implemented

Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately.
Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Avoid direct eye contact with product, also via contamination on hands

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Where activities may lead to aerosol release e.g. spraying, then additional skin and eye protection measures such as impervious suits and face shields may be required

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

8.3. Exposure estimation and reference to its source

8.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC4, ERC5)

Information for contributing exposure scenario

Qualitative Chemical Risk Assessment for the Environment

The main source of release of Single-Walled Carbon Nanotubes (SWCNT) to the environment is production as such (concentration 100%), whereas in once formulated into articles, its concentration is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant.

Currently, no hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. On the basis of currently available information on physico-chemical properties, environmental fate and behaviour, ecotoxicity and toxicity to humans, the substance has been assessed not to be a PBT or vPvB. In addition, the substance is not legally classified as 'dangerous for the environment' according to Table 3.1 of regulation (EC) No 1272/2008. Consequently, according to REACH regulation (EC) No 1907/2006, Article 14.4, an exposure assessment and risk characterisation for the environment, addressing quantitatively all identified uses of the registrant, is not required

8.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

8.3.3. Worker exposure Contributing scenario controlling worker exposure (PROC7)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

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

8.4.1. Environment

Guidance - Environment

No hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. Risk Management Measures are based on qualitative risk characterisation

8.4.2. Health

Guidance - Health

Risk Management Measures are based on qualitative risk characterisation

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

9. IW-4 - Uses at industrial sites: Use of additive in ceramic materials and to produce ceramic articles

9.1. Title section

Uses at industrial sites: Use of additive in ceramic materials and to produce ceramic articles

ES Ref.: IW-4

ES Type: Worker

Version: 2.0

Issue date: 10/01/2022

Environment	Use descriptors
Contributing scenario controlling environmental exposure	ERC4, ERC5

Worker	Use descriptors
Contributing scenario controlling worker exposure	PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9, PROC14 SU0, SU20 PC0
Contributing scenario controlling worker exposure	PROC7

Comment	Technical function of the substance: strengthening agent
Processes, tasks, activities covered	Industrial use
Assessment method	Qualitative approach used to conclude safe use

9.2. Conditions of use affecting exposure

9.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC4, ERC5)

ERC4	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC5	Use at industrial site leading to inclusion into/onto article
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)

Annual site tonnage	≤ 100 t/yr
Maximum daily site tonnage	476 kg/day
	210 days/yr

Technical and organisational conditions and measures

Onsite wastewater treatment required	Adoption of adsorption filters/flocculation units
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Conditions and measures related to sewage treatment plant

Municipal Sewage treatment plant

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations

Other conditions affecting environmental exposure

Water-based process, Wastewater emissions generated from equipment cleaning with water

9.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9, PROC14)

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
PROC6	Calendering operations
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC14	Tabletting, compression, extrusion, pelettisation, granulation

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

Sealing	
Local exhaust ventilation	
Clear spills immediately	
Ensure regular inspection, cleaning and maintenance of equipment and machines	
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed	

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

Assumes a good basic standard of occupational hygiene is implemented

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately.
Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Avoid direct eye contact with product, also via contamination on hands

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

9.2.3. Control of worker exposure: Contributing scenario controlling worker exposure (PROC7)

PROC7

Industrial spraying

Product (article) characteristics

Physical form of product

Solid, low dustiness

Concentration of substance in product

≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

≤ 100 t/yr

≤ 8 h/day

Technical and organisational conditions and measures

Sealing

Local exhaust ventilation

Spraying or fogging

Ensure that a spraying booth is used

Clear spills immediately

Ensure regular inspection, cleaning and maintenance of equipment and machines

Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed

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

Assumes a good basic standard of occupational hygiene is implemented

Avoid direct skin contact with product. Identify potential areas for indirect skin contact.
Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately.
Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop

Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves

Avoid direct eye contact with product, also via contamination on hands

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Where activities may lead to aerosol release e.g. spraying, then additional skin and eye protection measures such as impervious suits and face shields may be required

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

9.3. Exposure estimation and reference to its source

9.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC4, ERC5)

Information for contributing exposure scenario

Qualitative Chemical Risk Assessment for the Environment

The main source of release of Single-Walled Carbon Nanotubes (SWCNT) to the environment is production as such (concentration 100%), whereas in once formulated into articles, its concentration is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant.

Currently, no hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. On the basis of currently available information on physico-chemical properties, environmental fate and behaviour, ecotoxicity and toxicity to humans, the substance has been assessed not to be a PBT or vPvB. In addition, the substance is not legally classified as 'dangerous for the environment' according to Table 3.1 of regulation (EC) No 1272/2008. Consequently, according to REACH regulation (EC) No 1907/2006, Article 14.4, an exposure assessment and risk characterisation for the environment, addressing quantitatively all identified uses of the registrant, is not required

9.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

9.3.3. Worker exposure Contributing scenario controlling worker exposure (PROC7)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

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

9.4.1. Environment

Guidance - Environment

No hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. Risk Management Measures are based on qualitative risk characterisation

9.4.2. Health

Guidance - Health

Risk Management Measures are based on qualitative risk characterisation

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

10. IW-5 - Uses at industrial sites: Use of additive in lubricants

10.1. Title section

Uses at industrial sites: Use of additive in lubricants

ES Ref.: IW-5 ES Type: Worker Version: 2.0	Issue date: 10/01/2022
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Environment	Use descriptors
Contributing scenario controlling environmental exposure	ERC4, ERC5

Worker	Use descriptors
Contributing scenario controlling worker exposure	PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9 PC24 SU17
Contributing scenario controlling worker exposure	PROC7, PROC17

Comment	Technical function of the substance: used to improve mechanical resistance
Processes, tasks, activities covered	Industrial use
Assessment method	Qualitative approach used to conclude safe use

10.2. Conditions of use affecting exposure

10.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC4, ERC5)

ERC4	Use of non-reactive processing aid at industrial site (no inclusion into or onto article)
ERC5	Use at industrial site leading to inclusion into/onto article
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used, frequency and duration of use (or from service life)

Annual site tonnage	≤ 100 t/yr
Maximum daily site tonnage	476 kg/day
	210 days/yr

Technical and organisational conditions and measures

Onsite wastewater treatment required	Adoptation of adsorption filters/flocculation units
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	

Conditions and measures related to sewage treatment plant

Municipal Sewage treatment plant	
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Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations

Other conditions affecting environmental exposure

Water-based process, Wastewater emissions generated from equipment cleaning with water

10.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9)

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
PROC6	Calendering operations
PROC8a	Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b	Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

Product (article) characteristics

Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

Sealing	
Local exhaust ventilation	
Clear spills immediately	
Ensure regular inspection, cleaning and maintenance of equipment and machines	
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed	

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

Assumes a good basic standard of occupational hygiene is implemented	
Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop	

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Conditions and measures related to personal protection, hygiene and health evaluation	
Wear 2 pairs of gloves tested to EN374. Nitrile rubber gloves	
Avoid direct eye contact with product, also via contamination on hands	
Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses	
When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)	

Other conditions affecting workers exposure	
Indoor	
Temperature	≤ 40 °C

10.2.3. Control of worker exposure: Contributing scenario controlling worker exposure (PROC7, PROC17)

PROC7	Industrial spraying
PROC17	Lubrication at high energy conditions in metal working operations

Product (article) characteristics	
Physical form of product	Solid, low dustiness
Concentration of substance in product	≤ 100 %

Amount used (or contained in articles), frequency and duration of use/exposure	
	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures	
Sealing	
Local exhaust ventilation	
Spraying or fogging	Ensure that a spraying booth is used
Clear spills immediately	
Ensure regular inspection, cleaning and maintenance of equipment and machines	
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed	

Conditions and measures related to personal protection, hygiene and health evaluation	
Assumes a good basic standard of occupational hygiene is implemented	
Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear 2 pairs of gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop	
Wear 2 pairs gloves tested to EN374. Nitrile rubber gloves	
Avoid direct eye contact with product, also via contamination on hands	
Use eye protection according to EN 166. Tightly fitting safety goggles. Safety glasses with side shields. Do not wear contact lenses	

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

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

When working outside the local exhaust ventilation: full face mask (DIN EN 136). When handling under a fume hood: Filtering Half-face mask (DIN EN 149) (FFP3)

Where activities may lead to aerosol release e.g. spraying, then additional skin and eye protection measures such as impervious suits and face shields may be required

Other conditions affecting workers exposure

Indoor

Temperature

≤ 40 °C

10.3. Exposure estimation and reference to its source

10.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC4, ERC5)

Information for contributing exposure scenario

Qualitative Chemical Risk Assessment for the Environment

The main source of release of Single-Walled Carbon Nanotubes (SWCNT) to the environment is production as such (concentration 100%), whereas in once formulated into articles, its concentration is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant.

Currently, no hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. On the basis of currently available information on physico-chemical properties, environmental fate and behaviour, ecotoxicity and toxicity to humans, the substance has been assessed not to be a PBT or vPvB. In addition, the substance is not legally classified as 'dangerous for the environment' according to Table 3.1 of regulation (EC) No 1272/2008. Consequently, according to REACH regulation (EC) No 1907/2006, Article 14.4, an exposure assessment and risk characterisation for the environment, addressing quantitatively all identified uses of the registrant, is not required

10.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC1, PROC2, PROC3, PROC4, PROC6, PROC8a, PROC8b, PROC9)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

10.3.3. Worker exposure Contributing scenario controlling worker exposure (PROC7, PROC17)

Information for contributing exposure scenario

Qualitative risk characterisation. The minimum RMM necessary was applied to ensure the exposure levels are safe (covering the relevant endpoints, including eye irritation, and the combined risks) taking into account for uncertainty of exposure estimation

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

10.4.1. Environment

Guidance - Environment

No hazards to the environment are known, but precautionary measures to protect environment from exposure are established to mitigate any risk not yet known. Risk Management Measures are based on qualitative risk characterisation

10.4.2. Health

Guidance - Health

Risk Management Measures are based on qualitative risk characterisation

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

11. SL-1 - Article service life: Use of polymers, elastomers and resins articles

11.1. Title section

Article service life: Use of polymers, elastomers and resins articles

ES Ref.: SL-1

ES Type: Worker; Consumer

Version: 2.0

Issue date: 10/01/2022

Environment	Use descriptors
Contributing scenario controlling environmental exposure	ERC10a, ERC11a, ERC12a, ERC12c AC1, AC2, AC3, AC5, AC10, AC13

Worker	Use descriptors
Contributing scenario controlling worker exposure	PROC21, PROC24, PROC28

Comment	Technical function of the substance: conductive agent; flame retardant; used to improve mechanical, electrical and thermal conductivity and to impart wear resistance.
Processes, tasks, activities covered	Article service life (Workers, consumers)
Assessment method	Qualitative approach used to conclude safe use

11.2. Conditions of use affecting exposure

11.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC10a, ERC11a, ERC12a, ERC12c)

ERC10a	Widespread use of articles with low release (outdoor)
ERC11a	Widespread use of articles with low release (indoor)
ERC12a	Processing of articles at industrial sites with low release
ERC12c	Use of articles at industrial sites with low release
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics

Physical form of product	Solid, bound in article matrix
Concentration of substance in product	≤ 10 %

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations	
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11.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC21, PROC24, PROC28)

PROC21	Low energy manipulation and handling of substances bound in/on materials or articles
PROC24	High (mechanical) energy work-up of substances bound in /on materials and/or articles
PROC28	Manual maintenance (cleaning and repair) of machinery

Product (article) characteristics

Physical form of product	Solid, bound in article matrix
Concentration of substance in product	≤ 10 %

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

The concentration of the substance in the article is very low and the substance is bound in the article; thus, the Eye irritation hazard is not of concern. Therefore, no risk management measures addressing eye irritation are required

Other conditions affecting workers exposure

Indoor	
Temperature	≤ 40 °C
Outdoor	

11.3. Exposure estimation and reference to its source

11.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC10a, ERC11a, ERC12a, ERC12c)

No information available

11.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC21, PROC24, PROC28)

No information available

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

11.4.1. Environment

Guidance - Environment	As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed. Consumer and professional workers only get exposed to the substance during service life in articles, in which the concentration of Single Wall Carbon Nanotubes is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant. Such articles are not disposed of to aquatic environments but typically do become collected as household waste and the end of their life cycle.
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11.4.2. Health

Guidance - Health	Consumer and professional workers only get exposed to the substance during service life in articles, in which the concentration of Single Wall Carbon Nanotubes is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant. The substance is not released under normal use conditions.
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Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

12. SL-2 - Article service life: Use of coated articles

12.1. Title section

Article service life: Use of coated articles

ES Ref.: SL-2 ES Type: Worker; Consumer Version: 2.0	Issue date: 10/01/2022
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Environment		Use descriptors
	Contributing scenario controlling environmental exposure	ERC10a, ERC11a, ERC12a, ERC12c AC1, AC2, AC7

Worker		Use descriptors
	Contributing scenario controlling worker exposure	PROC21, PROC24, PROC28

Comment	Technical function of the substance: corrosion inhibitor; durability agent; used to improve conductivity and abrasion resistance, used as conductive primer
Processes, tasks, activities covered	Article service life (Workers, consumers)
Assessment method	Qualitative approach used to conclude safe use

12.2. Conditions of use affecting exposure

12.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC10a, ERC11a, ERC12a, ERC12c)

ERC10a	Widespread use of articles with low release (outdoor)
ERC11a	Widespread use of articles with low release (indoor)
ERC12a	Processing of articles at industrial sites with low release
ERC12c	Use of articles at industrial sites with low release
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics

Physical form of product	Solid, bound in article matrix
Concentration of substance in product	≤ 10 %

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations	
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12.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC21, PROC24, PROC28)

PROC21	Low energy manipulation and handling of substances bound in/on materials or articles
PROC24	High (mechanical) energy work-up of substances bound in /on materials and/or articles
PROC28	Manual maintenance (cleaning and repair) of machinery

Product (article) characteristics

Physical form of product	Solid, bound in article matrix
Concentration of substance in product	≤ 10 %

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

The concentration of the substance in the article is very low and the substance is bound in the article; thus, the Eye irritation hazard is not of concern. Therefore, no risk management measures addressing eye irritation are required

Other conditions affecting workers exposure

Indoor	
Temperature	≤ 40 °C
Outdoor	

12.3. Exposure estimation and reference to its source

12.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC10a, ERC11a, ERC12a, ERC12c)

No information available

12.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC21, PROC24, PROC28)

No information available

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

12.4.1. Environment

Guidance - Environment	As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed. Consumer and professional workers only get exposed to the substance during service life in articles, in which the concentration of Single Wall Carbon Nanotubes is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant. Such articles are not disposed of to aquatic environments but typically do become collected as household waste and the end of their life cycle.
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12.4.2. Health

Guidance - Health	Consumer and professional workers only get exposed to the substance during service life in articles, in which the concentration of Single Wall Carbon Nanotubes is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant. The substance is not released under normal use conditions.
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Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

13. SL-3 - Article service life: Use of metal composites articles

13.1. Title section

Article service life: Use of metal composites articles

ES Ref.: SL-3

ES Type: Worker; Consumer

Version: 2.0

Issue date: 10/01/2022

Environment	Use descriptors
Contributing scenario controlling environmental exposure	ERC10a, ERC11a, ERC12a, ERC12c AC1, AC2, AC3, AC7

Worker	Use descriptors
Contributing scenario controlling worker exposure	PROC21, PROC24, PROC28

Comment	Technical function of the substance: tensile strenght and thermal creep resistance
Processes, tasks, activities covered	Article service life (Workers, consumers)
Assessment method	Qualitative approach used to conclude safe use

13.2. Conditions of use affecting exposure

13.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC10a, ERC11a, ERC12a, ERC12c)

ERC10a	Widespread use of articles with low release (outdoor)
ERC11a	Widespread use of articles with low release (indoor)
ERC12a	Processing of articles at industrial sites with low release
ERC12c	Use of articles at industrial sites with low release
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics

Physical form of product	Solid, bound in article matrix
Concentration of substance in product	≤ 10 %

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations	
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13.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC21, PROC24, PROC28)

PROC21	Low energy manipulation and handling of substances bound in/on materials or articles
PROC24	High (mechanical) energy work-up of substances bound in /on materials and/or articles
PROC28	Manual maintenance (cleaning and repair) of machinery

Product (article) characteristics

Physical form of product	Solid, bound in article matrix
Concentration of substance in product	≤ 10 %

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Amount used (or contained in articles), frequency and duration of use/exposure	
	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures	
The concentration of the substance in the article is very low and the substance is bound in the article; thus, the Eye irritation hazard is not of concern. Therefore, no risk management measures addressing eye irritation are required	

Other conditions affecting workers exposure	
Indoor	
Temperature	≤ 40 °C
Outdoor	

13.3. Exposure estimation and reference to its source

13.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC10a, ERC11a, ERC12a, ERC12c)

No information available

13.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC21, PROC24, PROC28)

No information available

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

13.4.1. Environment

Guidance - Environment	As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed. Consumer and professional workers only get exposed to the substance during service life in articles, in which the concentration of Single Wall Carbon Nanotubes is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant. Such articles are not disposed of to aquatic environments but typically do become collected as household waste and the end of their life cycle.
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13.4.2. Health

Guidance - Health	Consumer and professional workers only get exposed to the substance during service life in articles, in which the concentration of Single Wall Carbon Nanotubes is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant. The substance is not released under normal use conditions.
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Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

14. SL-4 - Article service life: Use of metal ceramic articles

14.1. Title section

Article service life: Use of metal ceramic articles

ES Ref.: SL-4

ES Type: Worker; Consumer

Version: 2.0

Issue date: 10/01/2022

Environment	Use descriptors
Contributing scenario controlling environmental exposure	ERC10a, ERC11a, ERC12a, ERC12c

Worker	Use descriptors
Contributing scenario controlling worker exposure	PROC21, PROC24 AC0

Comment	Technical function of the substance: strengthening agent
Processes, tasks, activities covered	Article service life (Workers, consumers)
Assessment method	Qualitative approach used to conclude safe use

14.2. Conditions of use affecting exposure

14.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC10a, ERC11a, ERC12a, ERC12c)

ERC10a	Widespread use of articles with low release (outdoor)
ERC11a	Widespread use of articles with low release (indoor)
ERC12a	Processing of articles at industrial sites with low release
ERC12c	Use of articles at industrial sites with low release
Assessment method	Qualitative approach used to conclude safe use

Product (article) characteristics

Physical form of product	Solid, bound in article matrix
Concentration of substance in product	≤ 10 %

Conditions and measures related to treatment of waste (including article waste)

External treatment and disposal of waste should comply with applicable local and/or national regulations	
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14.2.2. Control of worker exposure: Contributing scenario controlling worker exposure (PROC21, PROC24)

PROC21	Low energy manipulation and handling of substances bound in/on materials or articles
PROC24	High (mechanical) energy work-up of substances bound in /on materials and/or articles

Product (article) characteristics

Physical form of product	Solid, bound in article matrix
Concentration of substance in product	≤ 10 %

Single wall carbon nanotubes

Annex to the safety data sheet: Exposure scenario

Product form: Substance Physical state: Solid Substance type: Mono-constituent

Amount used (or contained in articles), frequency and duration of use/exposure

	≤ 100 t/yr
	≤ 8 h/day

Technical and organisational conditions and measures

The concentration of the substance in the article is very low and the substance is bound in the article; thus, the Eye irritation hazard is not of concern. Therefore, no risk management measures addressing eye irritation are required

Other conditions affecting workers exposure

Indoor	
Temperature	≤ 40 °C
Outdoor	

14.3. Exposure estimation and reference to its source

14.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC10a, ERC11a, ERC12a, ERC12c)

No information available

14.3.2. Worker exposure Contributing scenario controlling worker exposure (PROC21, PROC24)

No information available

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

14.4.1. Environment

Guidance - Environment	As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed. Consumer and professional workers only get exposed to the substance during service life in articles, in which the concentration of Single Wall Carbon Nanotubes is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant. Such articles are not disposed of to aquatic environments but typically do become collected as household waste and the end of their life cycle.
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14.4.2. Health

Guidance - Health	Consumer and professional workers only get exposed to the substance during service life in articles, in which the concentration of Single Wall Carbon Nanotubes is very low (<1% by weight) and bound in a matrix, in which the nano properties become irrelevant. The substance is not released under normal use conditions.
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