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

1.1. Product identifier ►

Product form	:	Substance
Trade name	:	TUBALL™
Product code	:	01RW02, 01RW03 Grades are part of one set of nanoform
IUPAC name	:	Single wall carbon nanotubes
EC-No.	:	943-098-9
CAS-No.	:	Not assigned 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.

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

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

Europe:	USA:	Asia:	China:	India:
OCSiAl Europe S.a.r.l.	OCSiAl LLC	OCSiAl Asia Pacific Co., Ltd.	OCSiAl Hong Kong Limited	OCSiAl PRIVATE LIMITED
L-3364, Leudelange, 1, rue de la Poudrerie, Grand Duchy of Luxembourg	500 S Front St., Suite 860, Columbus, OH 43215, USA	Office 208, Pilot Plant Bldg., Incheon Technopark 12 Gaetbeol-ro, Yeonsu-gu, Incheon, 406-840 Republic of Korea	No. 1102, 11/F, Lippo Sun Plaza, 28 Canton Road, Tsim Sha Tsui, Kowloon, Hong Kong	A504 Universal BusinessPark, Ansa Industrial Estate, Chandivali, Andheri (E) Mumbai 400072
T +352 27 99 03 73 09.00-17.00 GMT+2	T +1 415 906 5271 09.00-17.00 GMT-4	T +82 32 260 0407 09.00-17.00 GMT+9	T +852 3575 3943 09:00-17:00; GMT+8	T +91 22 4120 8615 09:00-17:00; GMT+5.5
europe@ocsial.com	usa@ocsial.com	asiapacific@ocsial.com	china@ocsial.com	india@ocsial.com

1.4. Emergency telephone number (24h/day) - for emergency only involving spill, leak, fire, exposure or accident call ►

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 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

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

SECTION 3: Composition/information on ingredients

3.1. Substances ►

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-statements: see section 16
* Single wall carbon nanotubes TUBALL™

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.

First-aid measures after eye contact : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical 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

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Powder, Alcohol-resistant foam, Water spray, Carbon dioxide (CO2).

Unsuitable extinguishing media : None known.

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).

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 : Avoid formation of dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Evacuate area.

6.1.2. For emergency responders

Protective equipment : Wear suitable protective clothing, gloves and eye/face 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 : 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.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed : None known.

Precautions for safe handling : Avoid contact with skin and eyes. Carry out operations in the open/under local exhaust/ventilation or with respiratory protection.

Hygiene measures : Do not eat, drink or smoke when using this product. Wash contaminated clothing before reuse.

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.

Maximum storage period : 6 years

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters ►

TUBALL™	
DNEL/DMEL (Workers)	
Acute - systemic effects, dermal	no hazard identified
Acute - systemic effects, inhalation	low hazard (no threshold derived)
Acute - local effects, dermal	no hazard identified
Acute - local effects, inhalation	low hazard (no threshold derived)
Long-term - systemic effects, dermal	no hazard identified
Long-term - local effects, dermal	no hazard identified
Long-term - systemic effects, inhalation	low hazard (no threshold derived)
Long-term - local effects, inhalation	low hazard (no threshold derived)
DNEL/DMEL (General population)	
Acute - systemic effects, dermal	no hazard identified
Acute - systemic effects, inhalation	low hazard (no threshold derived)
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,oral	no hazard identified
Long-term - systemic effects, inhalation	low hazard (no threshold derived)
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
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

8.2. Exposure controls

Personal protective equipment:

Gloves. Safety glasses. Protective clothing. Dust production: dust mask with filter type P3.

Hand protection:

Wear suitable gloves. EN 374

Type	Material	Permeation	Thickness (mm)	Penetration	Standard
Reusable gloves	Use neoprene or rubber gloves	3 (> 60 minutes)	> 0.35 mm		EN 374

Eye protection:

Safety glasses with side shields. EN 166

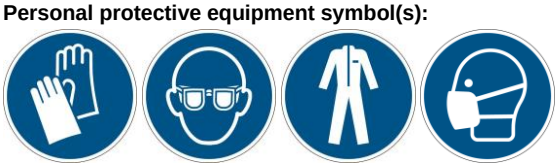
Skin and body protection:

Protective clothing (with elasticated cuffs and closed neck). EN 14605

Respiratory protection:

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

Personal protective equipment symbol(s):



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
Appearance	:	Powder. Nanomaterial.
Colour	:	Black.
Odour	:	Odourless.
Odour threshold	:	No data available
pH	:	No data available
Relative evaporation rate (butylacetate=1)	:	No data available
Melting point	:	> 400 °C @ 101325 Pa
Freezing point	:	Not applicable
Boiling point	:	No data available
Flash point	:	Not applicable
Auto-ignition temperature	:	> 400 °C @ 101325 Pa
Decomposition temperature	:	No data available
Flammability (solid, gas)	:	Non flammable.
Vapour pressure	:	No data available
Relative vapour density at 20 °C	:	No data available
Relative density	:	1.877 g/cm³ at 20 °C
Solubility	:	Insoluble in: Water, Organic solvents. Water: 1 mg/l at 20 °C
Partition coefficient n-octanol/water (Log Pow)	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available
Explosive properties	:	Not explosive.
Oxidising properties	:	Non oxidizing.
Explosive limits	:	Not applicable

9.2. Other information

No additional information available

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 toxicological effects ►

Acute toxicity (oral) : Not classified

Acute toxicity (dermal) : Not classified

Acute toxicity (inhalation) : Not classified

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

TUBALL™	
NOAEL (animal/female, F0/P)	> 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

TUBALL™	
NOAEL (oral, rat, 90 days)	> 1000 mg/kg bodyweight/day – OECD 422

Aspiration hazard : Not classified

SECTION 12: Ecological information

12.1. Toxicity

Hazardous to the aquatic environment, short-term (acute) : Not classified (OECD 201. OECD 202)

Hazardous to the aquatic environment, long-term (chronic) : Not classified

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

TUBALL™
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. 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.

SECTION 14: Transport information

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

ADR	IMDG	IATA	ADN	RID
14.1. UN number				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.2. UN proper shipping name				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.3. Transport hazard class(es)				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.4. Packing group				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.5. Environmental hazards				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
No supplementary information available				

14.6. Special precautions for user

Overland transport
Not applicable

Transport by sea
Not applicable

Air transport
Not applicable

Inland waterway transport
Not applicable

Rail transport
Not applicable

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

Not applicable

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

No REACH Annex XVII restrictions
TUBALL™ is not on the REACH Candidate List
TUBALL™ is not on the REACH Annex XIV List
TUBALL™ is not subject to Regulation (EU) No 649/2012 of the European Parliament and of the Council of 4 july 2012 concerning the export and import of hazardous chemicals.
TUBALL™ is not subject to Regulation (EU) No 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants

15.1.2. National regulations ►

USA
This product is subject to the Significant New Use Rule (SNUR) published by the United States Environmental Protection Agency on December 5, 2019 in Federal Register Vol. 84, No. 234.

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
NIET-limitatieve lijst van voor de voortplanting giftige stoffen – Borstvoeding	:	The substance is not listed

NIET-limitatieve lijst van voor de voortplanting giftige stoffen – Vruchtbaarheid : The substance is not listed

NIET-limitatieve lijst van voor de voortplanting giftige stoffen – Ontwikkeling : The substance is not listed

15.2. Chemical safety assessment

A chemical safety assessment has been carried out

SECTION 16: Other information

Abbreviations and acronyms:	
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
CAS-No.	Chemical Abstract Service number
CLP	Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
DMEL	Derived Minimal Effect level
DNEL	Derived-No Effect Level
EC-No.	European Community number
EN	European Standard
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
NOAEL	No-Observed Adverse Effect Level
PBT	Persistent Bioaccumulative Toxic
PNEC	Predicted No-Effect Concentration
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SDS	Safety Data Sheet
vPvB	Very Persistent and Very Bioaccumulative
WGK	Water Hazard Class

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
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 mixture 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

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

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.

SDS EU (REACH Annex II)

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.

Annex to the safety data sheet ►

Product exposure scenario(s)	
ES Type	**ES title**
Worker	Formulation: Formulation in polymers, elastomers and resins
Worker	Formulation: Formulation in coatings
Worker	Formulation: Formulation in metal matrix composites
Worker	Formulation: Formulation in ceramic materials
Worker	Formulation: Formulation in lubricants
Worker	Uses at industrial sites: Use of additive in polymers, elastomers and resins to produce articles
Worker	Uses at industrial sites: Use of additive in coatings and to produce coated articles
Worker	Uses at industrial sites: Use of additive in metal composites and to produce metal composites articles
Worker	Uses at industrial sites: Use of additive in ceramic materials and to produce ceramic articles
Worker	Uses at industrial sites: Use of additive in lubricants
Worker	Article service life: Use of polymers, elastomers and resins articles
Worker	Article service life: Use of coated articles
Worker	Article service life: Use of metal composites articles
Worker	Article service life: Use of metal ceramic articles

1. Exposure scenario F-1

Formulation: Formulation in polymers, elastomers and resins	
ES Ref.: F-1 ES Type: Worker Version: 1.0	Issue date: 27/05/2020

Use descriptors	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19 PC32, PC33 ERC3
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.

2. Operational conditions and risk management measures

2.1. 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 mixture into small containers (dedicated filling line, including weighing)
PROC19	Manual activities involving hand contact

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	

2.2. Contributing scenario controlling environmental exposure (ERC3)

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

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

Operational conditions		
Amounts used	Annual site tonnage	≤ 100 t/yr
	Maximum daily site tonnage (kg/day)	476
Frequency and duration of use		210 days/yr
Other given operational conditions affecting environmental exposure	Water-based process,Wastewater emissions generated from equipment cleaning with water	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Prevent discharge of undissolved substance to or recover from onsite wastewater. Elimination from water is possible through precipitation or flocculation.	Prevent discharge of undissolved substance to or recover from onsite wastewater.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	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 STP	
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1	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.

3.2. Environment

Information for contributing exposure scenario	
2.2	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. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Risk Management Measures are based on qualitative risk characterisation.

4.2. 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. Exposure scenario F-2

Formulation: Formulation in coatings	
ES Ref.: F-2 ES Type: Worker Version: 1.0	Issue date: 27/05/2020

Use descriptors	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19 PC9a ERC2
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. Operational conditions and risk management measures

2.1. 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 mixture into small containers (dedicated filling line, including weighing)
PROC19	Manual activities involving hand contact

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	

Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	

2.2. Contributing scenario controlling environmental exposure (ERC2)

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

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

Operational conditions		
Amounts used	Annual site tonnage	≤ 100 t/yr
	Maximum daily site tonnage (kg/day)	476
Frequency and duration of use		210 days/yr
Other given operational conditions affecting environmental exposure	Water-based process,Wastewater emissions generated from equipment cleaning with water	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Prevent discharge of undissolved substance to or recover from onsite wastewater. Elimination from water is possible through precipitation or flocculation.	Prevent discharge of undissolved substance to or recover from onsite wastewater.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	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 STP	
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1	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.

3.2. Environment

Information for contributing exposure scenario	
2.2	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. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Risk Management Measures are based on qualitative risk characterisation.

4.2. 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. Exposure scenario F-3

Formulation: Formulation in metal matrix composites	
ES Ref.: F-3 ES Type: Worker Version: 1.0	Issue date: 27/05/2020

Use descriptors	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19 PC0 ERC3
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.

2. Operational conditions and risk management measures

2.1. 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 mixture into small containers (dedicated filling line, including weighing)
PROC19	Manual activities involving hand contact

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	

Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	

2.2. Contributing scenario controlling environmental exposure (ERC3)

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

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

Operational conditions		
Amounts used	Annual site tonnage	≤ 100 t/yr
	Maximum daily site tonnage (kg/day)	476
Frequency and duration of use		210 days/yr
Other given operational conditions affecting environmental exposure	Water-based process,Wastewater emissions generated from equipment cleaning with water	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Prevent discharge of undissolved substance to or recover from onsite wastewater. Elimination from water is possible through precipitation or flocculation.	Prevent discharge of undissolved substance to or recover from onsite wastewater.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	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 STP	
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1	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.

3.2. Environment

Information for contributing exposure scenario	
2.2	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. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Risk Management Measures are based on qualitative risk characterisation.

4.2. 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. Exposure scenario F-4

Formulation: Formulation in ceramic materials	
ES Ref.: F-4 ES Type: Worker Version: 1.0	Issue date: 27/05/2020

Use descriptors	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19 PC0 ERC3
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.

2. Operational conditions and risk management measures

2.1. 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 mixture into small containers (dedicated filling line, including weighing)
PROC19	Manual activities involving hand contact

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	

Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	

2.2. Contributing scenario controlling environmental exposure (ERC3)

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

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

Operational conditions		
Amounts used	Annual site tonnage	≤ 100 t/yr
	Maximum daily site tonnage (kg/day)	476
Frequency and duration of use		210 days/yr
Other given operational conditions affecting environmental exposure	Water-based process,Wastewater emissions generated from equipment cleaning with water	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Prevent discharge of undissolved substance to or recover from onsite wastewater. Elimination from water is possible through precipitation or flocculation.	Prevent discharge of undissolved substance to or recover from onsite wastewater.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	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 STP	
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1	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.

3.2. Environment

Information for contributing exposure scenario	
2.2	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. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Risk Management Measures are based on qualitative risk characterisation.

4.2. 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. Exposure scenario F-5

Formulation: Formulation in lubricants	
ES Ref.: F-5 ES Type: Worker Version: 1.0	Issue date: 27/05/2020

Use descriptors	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC19 PC24 ERC2
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.

2. Operational conditions and risk management measures

2.1. 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 mixture into small containers (dedicated filling line, including weighing)
PROC19	Manual activities involving hand contact

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	

Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	

2.2. Contributing scenario controlling environmental exposure (ERC2)

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

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

Operational conditions		
Amounts used	Annual site tonnage	≤ 100 t/yr
	Maximum daily site tonnage (kg/day)	476
Frequency and duration of use		210 days/yr
Other given operational conditions affecting environmental exposure	Water-based process,Wastewater emissions generated from equipment cleaning with water	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Prevent discharge of undissolved substance to or recover from onsite wastewater. Elimination from water is possible through precipitation or flocculation.	Prevent discharge of undissolved substance to or recover from onsite wastewater.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	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 STP	
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1	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.

3.2. Environment

Information for contributing exposure scenario	
2.2	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. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Risk Management Measures are based on qualitative risk characterisation.

4.2. 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. Exposure scenario IW-1

Uses at industrial sites: Use of additive in polymers, elastomers and resins to produce articles	
ES Ref.: IW-1 ES Type: Worker Version: 1.0	Issue date: 27/05/2020

Use descriptors	SU5, SU11, SU12, SU20 PROC1, PROC2, PROC3, PROC4, PROC6, PROC7, PROC8a, PROC8b, PROC9, PROC14 PC32, PC33 ERC4, ERC5
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.

2. Operational conditions and risk management measures

2.1.1. 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 mixture into small containers (dedicated filling line, including weighing)
PROC14	Tabletting, compression, extrusion, pelettisation, granulation

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	

Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	

2.1.2. Contributing scenario controlling worker exposure (PROC7)

PROC7	Industrial spraying

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	
	Spraying or fogging	Ensure that a spraying booth is used.
	Clear spills immediately	

Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	
	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.	

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

Operational conditions		
Amounts used	Annual site tonnage	≤ 100 t/yr
	Maximum daily site tonnage (kg/day)	476
Frequency and duration of use		210 days/yr
Other given operational conditions affecting environmental exposure	Water-based process,Wastewater emissions generated from equipment cleaning with water	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Prevent discharge of undissolved substance to or recover from onsite wastewater. Elimination from water is possible through precipitation or flocculation.	Prevent discharge of undissolved substance to or recover from onsite wastewater.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	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 STP	
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1 2.1.2	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.

3.2. Environment

Information for contributing exposure scenario	
2.2	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. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Risk Management Measures are based on qualitative risk characterisation.

4.2. 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. Exposure scenario IW-2

Uses at industrial sites: Use of additive in coatings and to produce coated articles	
ES Ref.: IW-2 ES Type: Worker Version: 1.0	Issue date: 27/05/2020

Use descriptors	SU14, SU15, SU16, SU17, SU18, SU20 PROC1, PROC2, PROC3, PROC4, PROC6, PROC7, PROC8a, PROC8b, PROC9, PROC10 PC9a ERC4, ERC5
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.

2. Operational conditions and risk management measures

2.1.1. 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 mixture into small containers (dedicated filling line, including weighing)
PROC10	Roller application or brushing

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	

2.1.2. Contributing scenario controlling worker exposure (PROC7)

PROC7	Industrial spraying

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	
	Spraying or fogging	Ensure that a spraying booth is used.
Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	
	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.	

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

Operational conditions		
Amounts used	Annual site tonnage	≤ 100 t/yr
	Maximum daily site tonnage (kg/day)	476
Frequency and duration of use		210 days/yr
Other given operational conditions affecting environmental exposure	Water-based process,Wastewater emissions generated from equipment cleaning with water	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Prevent discharge of undissolved substance to or recover from onsite wastewater. Elimination from water is possible through precipitation or flocculation.	Prevent discharge of undissolved substance to or recover from onsite wastewater.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	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 STP	
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1 2.1.2	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.

3.2. Environment

Information for contributing exposure scenario	
2.2	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. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Risk Management Measures are based on qualitative risk characterisation.

4.2. 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. Exposure scenario IW-3

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

ES Ref.: IW-3 ES Type: Worker Version: 1.0	Issue date: 27/05/2020

Use descriptors	SU15, SU16, SU17, SU20 PROC1, PROC2, PROC3, PROC4, PROC6, PROC7, PROC8a, PROC8b, PROC9 PC0 ERC4, ERC5
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.

2. Operational conditions and risk management measures

2.1.1. 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 mixture into small containers (dedicated filling line, including weighing)

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	

2.1.2. Contributing scenario controlling worker exposure (PROC7)

PROC7	Industrial spraying

Product characteristics	
Physical form of product	Solid, low dustiness

Concentration of substance in product	≤ 100 %

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	
	Spraying or fogging	Ensure that a spraying booth is used.
Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	
	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.	

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

Operational conditions		
Amounts used	Annual site tonnage	≤ 100 t/yr
	Maximum daily site tonnage (kg/day)	476
Frequency and duration of use		210 days/yr
Other given operational conditions affecting environmental exposure	Water-based process,Wastewater emissions generated from equipment cleaning with water	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Prevent discharge of undissolved substance to or recover from onsite wastewater. Elimination from water is possible through precipitation or flocculation.	Prevent discharge of undissolved substance to or recover from onsite wastewater.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	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 STP	
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1 2.1.2	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.

3.2. Environment

Information for contributing exposure scenario	
2.2	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. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Risk Management Measures are based on qualitative risk characterisation.

4.2. 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. Exposure scenario IW-4

Uses at industrial sites: Use of additive in ceramic materials and to produce ceramic articles	
ES Ref.: IW-4 ES Type: Worker Version: 1.0	Issue date: 27/05/2020

Use descriptors	SU0, SU20 PROC1, PROC2, PROC3, PROC4, PROC6, PROC7, PROC8a, PROC8b, PROC9, PROC14 PC0 ERC4, ERC5
Comment	Technical function of the substance: strengthening agent
Processes, tasks, activities covered	Industrial use
Assessment method	Qualitative approach used to conclude safe use.

2. Operational conditions and risk management measures

2.1.1. 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 mixture into small containers (dedicated filling line, including weighing)
PROC14	Tabletting, compression, extrusion, pelettisation, granulation

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	

2.1.2. Contributing scenario controlling worker exposure (PROC7)

PROC7	Industrial spraying

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
	Local exhaust ventilation	

Technical conditions and measures to control dispersion from source towards the worker	Spraying or fogging	Ensure that a spraying booth is used.
Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	
	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.	

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

Operational conditions		
Amounts used	Annual site tonnage	≤ 100 t/yr
	Maximum daily site tonnage (kg/day)	476
Frequency and duration of use		210 days/yr
Other given operational conditions affecting environmental exposure	Water-based process,Wastewater emissions generated from equipment cleaning with water	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Prevent discharge of undissolved substance to or recover from onsite wastewater. Elimination from water is possible through precipitation or flocculation.	Prevent discharge of undissolved substance to or recover from onsite wastewater.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	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 STP	
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1 2.1.2	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.

3.2. Environment

Information for contributing exposure scenario	
2.2	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. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Risk Management Measures are based on qualitative risk characterisation.

4.2. 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. Exposure scenario IW-5

Uses at industrial sites: Use of additive in lubricants	
ES Ref.: IW-5 ES Type: Worker Version: 1.0	Issue date: 27/05/2020

Use descriptors	SU17 PROC1, PROC2, PROC3, PROC4, PROC6, PROC7, PROC8a, PROC8b, PROC9, PROC17 PC24 ERC4
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.

2. Operational conditions and risk management measures

2.1.1. 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 mixture into small containers (dedicated filling line, including weighing)

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	

2.1.2. Contributing scenario controlling worker exposure (PROC7, PROC17)

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

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

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	sealing	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation	
	Spraying or fogging	Ensure that a spraying booth is used.
Organisational measures to prevent /limit releases, dispersion and exposure	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. 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 suitable 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)	
	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.	

2.2. Contributing scenario controlling environmental exposure (ERC4)

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

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

Operational conditions		
Amounts used	Annual site tonnage	≤ 100 t/yr
	Maximum daily site tonnage (kg/day)	476
Frequency and duration of use		210 days/yr
Other given operational conditions affecting environmental exposure	Water-based process,Wastewater emissions generated from equipment cleaning with water	

Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Prevent discharge of undissolved substance to or recover from onsite wastewater. Elimination from water is possible through precipitation or flocculation.	Prevent discharge of undissolved substance to or recover from onsite wastewater.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	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 STP	
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1.1 2.1.2	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.

3.2. Environment

Information for contributing exposure scenario	
2.2	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. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

4.1. Health

Guidance - Health	Risk Management Measures are based on qualitative risk characterisation.

4.2. 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. Exposure scenario SL-1

Article service life: Use of polymers, elastomers and resins articles	
ES Ref.: SL-1 ES Type: Worker; Consumer Version: 1.0	Issue date: 27/05/2020

Use descriptors	PROC21, PROC24, PROC28 AC1, AC2, AC3, AC5, AC10, AC13 ERC10a, ERC11a, ERC12a, ERC12c
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.

2. Operational conditions and risk management measures

2.1. 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 characteristics	
Physical form of product	Solid, Bound in article matrix
Concentration of substance in product	≤ 10 %

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C
	Outdoor	

Risk Management 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.

2.2. 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 characteristics	
Physical form of product	Solid, Bound in article matrix
Concentration of substance in product	≤ 10 %

Risk Management Measures		
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1	No additional information available

3.2. Environment

Information for contributing exposure scenario	
2.2	No additional information available

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

4.1. 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.

4.2. 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.

1. Exposure scenario SL-2

Article service life: Use of coated articles	
ES Ref.: SL-2 ES Type: Worker; Consumer Version: 1.0	Issue date: 27/05/2020

Use descriptors	PROC21, PROC24, PROC28 AC1, AC2, AC7 ERC10a, ERC11a, ERC12a, ERC12c
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.

2. Operational conditions and risk management measures

2.1. 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 characteristics	
Physical form of product	Solid, Bound in article matrix
Concentration of substance in product	≤ 10 %

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C
	Outdoor	

Risk Management 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.

2.2. 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 characteristics	
Physical form of product	Solid, Bound in article matrix
Concentration of substance in product	≤ 10 %

Risk Management Measures		
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1	No additional information available

3.2. Environment

Information for contributing exposure scenario	
2.2	No additional information available

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

4.1. 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.

4.2. 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.

1. Exposure scenario SL-3

Article service life: Use of metal composites articles	
ES Ref.: SL-3 ES Type: Worker; Consumer Version: 1.0	Issue date: 27/05/2020

Use descriptors	PROC21, PROC24, PROC28 AC1, AC2, AC3, AC7 ERC10a, ERC11a, ERC12a, ERC12c
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.

2. Operational conditions and risk management measures

2.1. 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 characteristics	
Physical form of product	Solid, Bound in article matrix
Concentration of substance in product	≤ 10 %

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C
	Outdoor	

Risk Management 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.

2.2. 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 characteristics	
Physical form of product	Solid, Bound in article matrix
Concentration of substance in product	≤ 10 %

Risk Management Measures		
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1	No additional information available

3.2. Environment

Information for contributing exposure scenario	
2.2	No additional information available

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

4.1. 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.

4.2. 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.

1. Exposure scenario SL-4

Article service life: Use of metal ceramic articles	
ES Ref.: SL-4 ES Type: Worker; Consumer Version: 1.0	Issue date: 27/05/2020

Use descriptors	PROC21, PROC24 AC0 ERC10a, ERC11a, ERC12a, ERC12c
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.

2. Operational conditions and risk management measures

2.1. 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 characteristics	
Physical form of product	Solid, Bound in article matrix
Concentration of substance in product	≤ 10 %

Operational conditions		
Amounts used		≤ 100 t/yr
Frequency and duration of use		≤ 8 h/day
Other given operational conditions affecting workers exposure	indoor	
	Temperature	<= 40 °C
	Outdoor	

Risk Management 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.

2.2. 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 characteristics	
Physical form of product	Solid, Bound in article matrix
Concentration of substance in product	≤ 10 %

Risk Management Measures		
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations	

3. Exposure estimation and reference to its source

3.1. Health

Information for contributing exposure scenario	
2.1	No additional information available

3.2. Environment

Information for contributing exposure scenario	
2.2	No additional information available

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

4.1. 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.

4.2. 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.