x **SAFETY DATA SHEET**

Date: 4 March, 2021 **Former date:** 13 February, 2020

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

1.1 Product identifier

Trade name
GrowInk™-N

Company product code
GINK-N250-002, GINK-N250-005, GINK-N250-010

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

The uses of the chemical
GrowInk™-N can be used in life science applications.

GrowInk™-N is a material for 3D bioprinting.

For research use only, not for use in diagnostic or therapeutic procedures.

1.3 Details of the supplier of the safety data sheet

Manufacturer, importer, other undertaking

UPM-Kymmene Corporation

Street address	Alvar Aallon katu 1
Postcode and post office	FI-00100, Helsinki
Post-office box	P.O. Box 380
Postcode and post office	FI-00101, Helsinki
Telephone number	+358 20 41 51 11
E-mail address	biomedicals@upm.com
Finnish Business ID (Y code)	1041090-0

1.4 Emergency information

Emergency telephone number 112

Poison Information centre (in Finland), open 24 h daily
P.O. Box 790 (Tukholmankatu 17)
00029 HUS

tel. +358 9 471977 or 0800 147 111

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

In accordance with current regulations (1272/2008 CLP), this substance has not been classified as dangerous.

2.2 Label elements

No labelling required. In accordance with current regulations, this substance has not been classified as hazardous.

2.3 Other hazards

If dry, the material forms organic dust. Occupational exposure limits values have been defined for cellulose dust (see Section 8). The dust may also be flammable.

The product contains micro- and nano-sized cellulose fibrils. The length of the fibrils may be several micrometers, while the diameter is in the nanometer scale (5 - 100 nm).

SECTION 3:COMPOSITION/INFORMATION ON INGREDIENTS

The product contains cellulose (CAS 9004-34-6) and purified water (CAS number 732-18-5). The fibrils are isolated from *Pinus sylvestris* and *Picea abies* or *Betula sp.* grown in Finland. The product has been autoclaved at 121 °C.

Hazardous ingredients

CAS/EC number and the registration number	Name of the ingredient	Concentration	Classification

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

Inhalation: Move to fresh air. Get medical attention if symptoms appear.
Skin contact: Wash with water. Get medical attention if irritation occurs.
Eye contact: Rinse with plenty of water for several minutes. Get medical attention if irritation occurs.
Ingestion: Rinse mouth with plenty of water. Ingestion of large quantities endeavour to vomit. Get medical attention if symptoms appear.

4.2 Most important symptoms and effects, both acute and delayed

Eye contact: Mechanical irritation may occur.

4.3 Indication of any immediate medical attention and special treatment needed

No special treatment needed.

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media

Water spray, foam, carbon dioxide.

5.2 Special hazards arising from the substance or mixture

The product itself is non-flammable. If dry, flammable organic dust may form.

5.3 Advice for firefighters

In large fires or in confined areas, use appropriate protective equipment and a self-contained breathing apparatus.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Handle carefully to avoid spilling, drying and dust formation. Remove all ignition sources.
Dust filters are recommended.

6.2 Environmental precautions

Minimize contamination of drains, surface and ground waters.

6.3 Methods and material for containment and cleaning up

Use appropriate tools to collect the product for disposal. Flush the area with water.

6.4 Reference to other sections

Personal protection equipment: see Section 8.2
Disposal: see Section 13

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

Handle the material in accordance with good industrial hygiene and safety practices. Wear protective gloves and clothes to avoid skin exposure. If exposed, wash the skin with water. Wear safety goggles to avoid splashes into eyes. In wet state, the product does not form dust. If dried, avoid inhalation of dust. Dust filters are recommended.

7.2 Conditions for safe storage, including any incompatibilities

Keep containers tightly closed. Store in a dry, cool and well-ventilated place protected from direct sunlight and away from highly flammable substances or materials. Protect from freezing.
No legal requirements concerning storage.

7.3 Specific end use(s)
Not reported.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

National occupational exposure limit values

The following occupational exposure limit values apply to cellulose dust.
HTP values : Organic dust 5 mg/m^3 (8 h) ; 10 mg/m^3 (15 min)
OSHA PEL: Total dust 15 mg/m^3, respirable nuisance dust 5.0 mg/m^3
NIOSH REL: 5 mg/m^3 (TWA)
ACGIH TLV: 10 mg/m^3 (microcrystalline cellulose)

Other limit values
UK (TWA): 10 mg/m^3 (total inhalable dust), 4 mg/m^3 (respirable dust)

8.2 Exposure controls

Appropriate engineering controls

Keep containers tightly closed and away from direct sunlight, ignition sources and heat.

Eye/face protection
It is recommended to wear eye protection.

Skin protection
It is recommended to protect skin from any splashes.

Hand protection
It is recommended to wear protective gloves.

Respiratory protection
If the product is dry, wear respiratory protection (filter P2).

Thermal hazards
The product itself is stable and non-flammable. If dried, flammable organic dust may form.

Environmental exposure controls
Prevent large amounts from entering sewers or environment.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Highly viscous, opaque, aqueous suspension gel.
Odour	Almost odorless.
Odour threshold	Not applicable.
pH	Neutral
Melting point/freezing point	Unknown.
Initial boiling point and boiling range	100 °C (water)
Flash point	Not applicable.
Evaporation rate	Unknown.
Flammability (solid, gas)	Not applicable. Non-flammable when moist.
Upper/lower flammability or explosive limits	Not applicable.

Vapour pressure	Not applicable.
Vapour density	Not applicable.
Relative density	Unknown.
Solubility(ies)	Insoluble in alcohols, diethyl ether, acetone, etc. Insoluble in cold or hot water.
Partition coefficient: n-octanol/water	Not applicable.
Auto-ignition temperature	Unknown.
Decomposition temperature	> 250 °C
Viscosity	Rheometric testing, Plate, Frequency flow sweep (1 - 55000 Pa.s)
Explosive properties	No risk of explosion.
Oxidising properties	Not oxidising.

9.2 Other information

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity
Not reactive under normal use and storage conditions.

10.2 Chemical stability
The product is stable under normal use and storage conditions.

10.3 Possibility of hazardous reactions
No hazardous reactions under normal use and storage conditions.

10.4 Conditions to avoid
Keep away from direct sunlight, ignition sources and heat.

10.5 Incompatible materials
Strong acids, strong alkalis

10.6 Hazardous decomposition products
Burning may produce toxic gases, e.g. carbon monoxide, nitrogen.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
This product is not classified as acutely toxic.

Data from similar compounds:
Cellulose, microcrystalline (CAS 9004-34-6) (ChemIDplusLite)
LD50 > 5000 mg/kg (oral, rat)
LD50 > 2000 mg/kg (dermal, rabbit)
LC50 > 5800 mg/m^3 (inhalation, rat, 4 h)
LD50 > 31600 mg/kg (intraperitoneal, rat)

Skin corrosion/irritation
Eyes Not irritating (rabbit)
Skin Not irritating (PII = 0/8.0) (rabbit)

UPM MICROFIBRILLATED CELLULOSE STERILE:
Tested at 1% concentration in de-ionized water. Skin irritation patch test with human volunteers (ISPE s.r.l.):
No skin irritation potential.

Serious eye damage/irritation
The product is not an eye irritant. However, mechanical irritation may occur.

Respiratory or skin sensitisation
Not sensitizing (Guinea pig)

Germ cell mutagenicity
The product is not classified as a mutagen.

Carcinogenicity
The product is not classified as a carcinogen. Not listed on NTP or IARC.

Reproductive toxicity
The product is not classified as a reproductive toxicant.

STOT-single exposure
The product is not classified as toxic to specific target organs.

STOT-repeated exposure
The product is not classified as toxic to specific target organs.

Aspiration hazard
The product is not classified as causing aspiration toxicity.

Other information
Respirable nuisance dust may form if the product dries.

UPM Microfibrillated cellulose (Vartiainen et al. 2011):
No evidence of inflammatory effects or cytotoxicity in mouse or human macrophages was observed after 6 and 24 h exposure. The results of toxicity studies suggest that the friction ground MFC is not cytotoxic and does not cause any effects on inflammatory system in macrophages.

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

There is no ecotoxicological data available on this specific product.

UPM Microfibrillated cellulose (Vartiainen et al. 2011):
Acute environmental toxicity assessed with kinetic luminescent bacteria test (*Vibrio fischerii*), NOEC > 100 mg/l

12.2 Persistence and degradability
Biodegradable in soil based on information from similar products. Chemical degradation produces carbon oxides (CO, CO_2) and water.

12.3 Bioaccumulative potential
No bioaccumulative potential.

12.4 Mobility in soil
Insoluble in water.

12.5 Results of PBT and vPvB assessment
The product is biodegradable, thus not considered to fulfill criteria for PBT or vPvB substances.

12.6 Other adverse effects
None reported.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Disposal according to current national and local official regulations.

SECTION 14: TRANSPORT INFORMATION

14.1 UN number
Not classified for transportation.

14.2 UN proper shipping name
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14.3 Transport hazard class(es)
-

14.4 Packing group
-

14.5 Environmental hazards
Not hazardous to the environment. Prevent large amounts from entering sewers or waterways.
Marine pollutant: No

14.6 Special precautions for user
Keep away from direct sunlight, ignition sources and heat. Do not allow the substance to dry. When dry, the substance is flammable.

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
Not applicable.

SECTION 15: REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
Relevant guidance and regulations concerning nanotechnology should be followed.

SECTION 16: OTHER INFORMATION

Date of preparation
21 October, 2019

Changes to previous version
21 October, 2019: MSDS amended
13 February, 2020: MSDS amended

Glossary of abbreviations
ACGIH: American Conference of Governmental Industrial Hygienists
EC50: Effective concentrations 50 % (median effective concentration). Statistically derived concentration of a substance in an environmental medium expected to produce a certain effect in 50% of test organisms in a given population under a defined set of conditions.
IARC: International Agency for Research of Cancer
LC50: Lethal concentration 50 % (median lethal concentration). Concentration of the substance which kills 50 % of exposed organisms.
LD50: Lethal dose 50 % (median lethal dose). Dose of the substance which kills 50 % of exposed organisms.
NIOSH: National Institute for Occupational Safety and Health
NOEL: No observable effect level. Highest concentration of the substance at which no effect was observed.
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration (United States)
PEL: Permissible exposure limit
REL: Recommended exposure limit
TLV: Threshold limit value
TWA: Time-weighted average

References
Material safety data by UPM
National Library of Medicine: ChemIDplusLite
Vartiainen et al. (2011). Health and environmental safety aspects of friction grinding and spray drying of microfibrillated cellulose. Cellulose DOI 10.1007/s10570-011-9501-7
Laughlin et al. 2008, Science 320:664-7: In vivo imaging of membrane-associated glycans in developing zebrafish

Kurmi et al. 2017, RSC Adv 7:18803-14
Araujo et al. 2003, Int J Pharmac 260:303-14
Shamsipur et al. 2013, AAPS PharmSciTech 14:287-93
Decree on Concentrations Known to be Harmful (1214/2016), HTP values