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

1.1 Product identifier

Product name: Insert Product Name

Other common names or synonyms: cellulose nanofibrils (CNF), microfibrillated cellulose, fibrillated cellulose, microfibrils, nanofibrillated cellulose, cellulose nanofibers

CAS no: 9004-34-6 (Cellulose, manufactured nanofibril form)

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

Relevant identified uses:

Uses advised against:

1.3 Details of the supplier of the safety data sheet

Company: Insert Company Name

Address: Insert Address

Phone number: Insert Phone Number

Fax: Insert Fax

E-mail: Insert E-mail

1.4 Emergency telephone number

Emergency phone number: Insert Emergency Phone Number

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

STOT SE 3 (H335: May cause respiratory irritation)

2.2 Label elements

Hazard pictogram: GHS07: Exclamation mark

Signal word: WARNING

Hazard statements

H335: May cause respiratory irritation (if in powder form)

Precautionary statements

Precautionary statements – prevention

P210: If dry, keep away from all ignition sources including heat, sparks, open flames. Prevent dust accumulations to minimize explosion hazard.

P261: Avoid breathing dust

P262: Do not get in eyes, on skin, or on clothing

P271: Use only outdoors or in a well-ventilated area

P280: Wear protective gloves/protective clothing/eye protection/face protection

Precautionary statements – response

P304+P340: IF INHALED Remove victim to fresh air and keep at rest in a position comfortable for breathing.

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

P312: Call a POISON CENTER or doctor/physician if you feel unwell.

Precautionary statements – disposal

P501: Dispose of contents/container in accordance with local/regional/national/international regulation.



2.3 Other hazards

Explosion hazard: If powder form, strong explosion hazard if dust is dispersed into air at high enough concentrations

SECTION 3: Composition/information on ingredients

3.1. Substances

Description	CAS No.	Composition
9004-34-6 (Cellulose, manufactured nanofibril form)	9004-34-6 (Cellulose, manufactured nanofibril form)	100%

SECTION 4: First aid measures

4.1 Description of first aid measures	Inhalation	If dry powder, move to fresh air. Get medical attention if symptoms appear.
	Skin contact	Soap wash. Get medical attention if irritation occurs.
	Eye contact	Remove any contact lenses. Irrigate immediately. Get medical attention if irritation occurs.
4.2 Most important symptoms and effects, both acute and delayed	Ingestion	Do not induce vomiting unless directed to do so by medical personnel. Get medical attention if symptoms appear.
	Acute effects	Potential symptoms: Hoarseness, cough and phlegm. Exercise-induced dyspnea.
	Delayed effects	No data available.
4.3 Indication of any immediate medical attention and special treatment needed	Note to physician	This product may contain nanoscale particles. At this time, there is no further guidance specific to nanomaterial exposure.

SECTION 5: Firefighting measures

5.1 Extinguishing media	Use water, alcohol-resistant foam, dry chemical, or carbon dioxide.
5.2 Special hazards arising from the substance or mixture	Carbon monoxide, oxides of sulfur, carbon dioxide may form when heated to decomposition. Explosion: If powder, avoid generating dust.
5.3 Advice for fire fighters	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective clothing.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures	Remove ignition sources and provide sufficient ventilation. Avoid dispersal in air (i.e. clearing with compressed air), use current good practices. If powder, wear protective clothing and contained breathing apparatus for spills, avoid inhalation, and wash skin following contact. See section 8 for more details on protective equipment.
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6.2 Environmental precautions	In the case of accidental spill, keep away from drains, surface, and ground water. No acute environmental hazard.
6.3 Methods and materials for containment and cleaning up	Ensure the product is not present at concentration level above cellulose TLV (section 8.1). Use HEPA-filtered vacuum or wet wiping methods and avoid re-dispersion of nanomaterial powder into the air. For gel spills, use absorbent materials/liquid traps.
6.4. Reference to other sections	See sections 8 and 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling	Use precautions taken for handling and storage of dusts and fine powder. Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces.
7.2 Conditions for safe storage, including any compatibilities	Store in closed, tightly sealed containers in cool (4°C), dry, well-ventilated area, away from sources of ignition, electrostatic sparks, extreme heat, or mechanical friction. Protect from freezing. Do not store food or beverages in areas where materials are handled. Store away from strong oxidizing agents. Do not smoke in work area where materials are stored.
7.3. Specific end use(s)	Insert if known.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters	
CNF	Cellulose dust
Avoid inhalation exposure to dried/powder forms and dusts. No occupational exposure limits for nano-forms of cellulose exist. British Standards Institute has developed pragmatic guidance for Occupational Exposure Limit (OEL) - for insoluble nanomaterials a factor of 0.066*OEL of conventional material is proposed.	<i>OSHA Permissible Exposure Limit (PEL)</i> - 15 mg/m ³ (total dust); 5 mg/m ³ (respirable fraction) Time Weighted Average (TWA) <i>NIOSH Recommended Exposure Limit (REL)</i> – 10 mg/m ³ (total dust) TWA; 5 mg/m ³ (respirable fraction) TWA <i>American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV)</i> - 10 mg/m ³ TWA <i>British Columbia Occupational Exposure Limit (OEL)</i> – 10 mg/m ³ (total dust) TWA; 3 mg/m ³ (respirable fraction) TWA
8.2 Exposure controls	
8.2.1. Appropriate engineering controls: If user operations generate dust, fume, or mist, handle in a negative pressure cabinet or fume hood which has been tested and shown to provide effective containment to keep exposure to airborne contaminants below exposure limits. It is recommended that dust control equipment contain explosion relief vents. Assess the most likely routes of exposure and minimize risk. Refer to section 4.2.8.1 of ISO/TR 13329 for more information.	

8.2.2. Personal protection equipment: As with handling all substances, good hygiene practices are recommended. If dermal exposure is possible gloves, protective clothing, and goggles are recommended. In the absence of confirmatory measurements, inhalation exposure to dry forms should be avoided through the use of appropriate respirators when handled outside a glove box or fume hood.	
Gloves	Preliminary evidence suggests that butyl rubber gloves may be more protective than nitrile gloves. Regular disposal and replacement of gloves is recommended.
Protective Clothing	Cover skin to minimize dermal exposure, avoid direct contact with abraded or lacerated skin. Non-woven protective clothing is preferable to woven fabric laboratory coats. Prolonged use or reuse should be avoided.
Respirators and filters	Limit dispersion into the air, minimizing and contain operations for handling powders, and working with proper exhaust ventilation with HEPA filters is recommended. When handled outside a glove box or fume hood, full face respirators with N100 cartridges are recommended; see Guidance from NIOSH

SECTION 9: Physical and chemical properties

If no data available, required to state "no data available" for each section

9.1 Information on basic physical and chemical properties ADD OR LIST AS "NO DATA AVAILABLE"	9.2 Other information Particle-specific properties (SEE ISO TR 13329) NOT REQUIRED BUT SUGGESTED AS BEST PRACTICE
<p>Appearance Insert.</p> <p>Odor: Odorless</p> <p>Odor threshold: n/a</p> <p>pH: Insert</p> <p>Melting point/freezing point: n/a</p> <p>Initial boiling point and boiling range: n/a</p> <p>Flash point: Insert. Cellulose ca. 240°C</p> <p>Evaporation rate: n/a</p> <p>Flammability (solid, gas): Insert. Cellulose may be combustible at high temperature (240°C)</p> <p>Upper/lower flammability or explosive limits: Insert. Cellulose dust explosion class "St 2 – strong explosion". Cellulose dust deflagration index Kst = 229.</p> <p>Vapor pressure: n/a;</p> <p>Vapor density: n/a</p> <p>Relative density: Insert</p> <p>Solubility(ies): Insoluble; forms a gel</p> <p>Partition coefficient: n-octanol/water: No data.</p> <p>Auto-ignition temperature: Insert. Cellulose may self-ignite at high temperatures (ca. 240°C).</p> <p>Decomposition temperature: >349°C</p> <p>Viscosity: Insert</p> <p>Explosive properties: Insert if measured</p> <p>Oxidizing properties: Insert if measured</p>	<p>Particle core size: Insert # nm width, # nm length. Reported values range from 5-200 nm width and 130nm to 225µm length.</p> <p>Particle size distribution: Add # nm - # nm</p> <p>Agglomeration/aggregation state: Add hydrodynamic diameter (nm)</p> <p>Shape and aspect ratio: Add shape, aspect ratio; Reported shapes are fiber-like, and aspect ratio of 14-23.</p> <p>Specific surface area: Add specific surface area</p> <p>Surface chemistry/elemental composition: Add surface chemistry (coatings)</p> <p>Surface charge (zeta potential): Add surface charge (mV). Reported values range from -48 to -5 mV</p> <p>Dustiness: Add dustiness level. No published values for CNF, but cellulose nanocrystals have been reported as: moderate (inhalable: 1241-1526 mg/kg, thoracic: 754-976 mg/kg, respirable: 112-136 mg/kg; data from sulfuric acid process (O'Connor et al. 2014)</p> <p>Crystallinity: Insert crystallinity (%)</p>

SECTION 10: Stability and reactivity

10.1 Reactivity

Cellulose is stable.

Cellulose dust is classified as “St 2 – risk of strong explosion”, due to dust deflagration index Kst = 229 (OSHA CPL 03-00-008). At present, no data available for nanoscale cellulose.

10.2 Chemical stability: Insert.

10.3 Possibility of hazardous reactions: No data for CNF. Cellulose is slightly flammable to flammable in presence of open flames and sparks, and non-flammable in the presence of shocks. Self-ignition may occur at high temperatures.

10.4 Conditions to avoid: For dust: high temperatures, extreme pressure, electrostatic sparks, collisions, mechanical friction.

10.5 Incompatible materials: Oxidizing agents (e.g. chlorates, perchlorates, nitrates, peroxides, chlorine). Fire and explosions may occur from reactions involving pentafluoride, acetic acid and micro crystalline cellulose. Contact between cellulose and sodium nitrite at elevated temperatures results in vigorous burning from decomposition reaction.

10.6 Hazardous decomposition products: Carbon monoxide, oxides of sulfur, carbon dioxide may form when heated to decomposition.

SECTION 11: Toxicological information

[NOTE: Where available, data reported for CNF. Where not, studies with microcrystalline cellulose (MCC) or bulk cellulose.]

11.1.1 Likely routes of exposure

Inhalation, eye contact.

11.1.2 Immediate, delayed, or chronic effects

Short term exposure

Inhalation Data are limited; dust may be harmful if inhaled.

Ingestion No acute oral toxicity in mice exposed to TEMPO CNF (Shimotoyodome 2011). Acute oral exposure to microcrystalline cellulose (MCC) did not find any adverse effects (unpublished report, WHO 1998). LD50 > 5 mg/kg (JECFA 1998).

Dermal Dermal exposure to CNF in mice did not have any adverse effects, necrosis or allergic reaction (Hakkarainen 2016). No adverse effects in human skin cells exposed to CNF (Nordi 2016; Lopes 2017). No irritation following acute dermal exposure to MCC in rabbits (unpublished report, WHO 1998).

Eye No data available for CNF. Acute ocular instillation of MCC reported only minimal irritation at 2000 mg/kg (unpublished report, WHO 1998). LD50 in rabbits > 2000 mg/kg.

Long term exposure

Inhalation Data are limited. Occupational studies have shown long term exposure to dust and fibers in a factory setting (>10 mg/m³) may lead to decreased lung function (Kraus 2004).

Ingestion No data available for CNF. No adverse effects in rats consuming a 30% MCC diet for 72 days (WHO 1998); 0-20% cellulose diet 4 weeks in rat, no death nor growth effects (Hove 1978); 5, 10, 20% cellulose in rat diet for 21-days resulted in no deaths (Sundaravelli 1971); 10% MCC fed to rats for 35 weeks, no effects (Lupton 1988).

Dermal No data available.

Eye No data available.

11.1.3 Other measures of toxicity

Immunotoxicity	High exposures <i>in vitro</i> to CNF did not result in toxicity to immune cells (Vartiainen 2011; Colic 2014). Low concentrations of MCC caused acute inflammation that resolved (Nagato 2008).
Neurotoxicity	No data available.
Genotoxicity	No mutagenicity or genotoxicity observed in Ames assay (Pitkänen 2010); micronucleus assay (Aimonen 2015); <i>in vitro</i> (Lindberg 2014); or <i>in vivo</i> (Catalan, 2017). For cellulose, no mutagenicity in Ames assay (Pitkänen 2010); <i>in vitro</i> no DNA strand breakage nor chromosomal damage (Lindberg 2014); no micronucleus induction (Catalán 2014).
Carcinogenicity	No data available for CNF. Cellulose is not listed as a carcinogen by ACGIH, IARC, NTP or California Proposition 65. No increased tumorigenicity in rats fed 30% MCC diet (unpublished report, WHO 1998).
Reproductive toxicity	Limited mammalian data for CNF. No reproductive effects noted in rats fed 30% MCC diet (unpublished report, WHO 1998).
Biodurability/biopersistence	CNF (both TEMPO and homogenized) in artificial lung fluid did not degrade (Stefaniak 2014). Half time of cellulose fiber clearance from lungs was ~1000 days (Muhle 1997). MCC in artificial lung and alveolar fluid did not degrade (Seehra and Stefaniak 2013; Stefaniak 2014).

SECTION 12: Ecological information

12.1 Toxicity

Acute data

Zebrafish embryo	CNF-TEMPO (Forest Products Laboratory)	LOEC = ~ 2000 mg/L	Harper et al. 2016
	CNF-homogenization (Forest Products Laboratory)	LOEC = 200 mg/L	Harper et al. 2016
	CNF-homogenization (Maine Pilot Plant)	No mortality up to 2000 mg/L	Harper et al. 2016
Bacteria (<i>V. fischeri</i>)	1250 mg/L CNF (mechanically produced)	9% fluorescence inhibition	Vartiainen et al. 2011
Algae (<i>C. vulgaris</i>)	1-100 mg/L CNF (chemically produced)	Decreased viability after 96h	Pereira et al. 2014

Chronic data

No data for (COMPANY) CNF.

12.2 Persistence and biodegradability	No data for (COMPANY) CNF. CNF readily biodegradable: Mechanical CNF >70% degraded by day 28, approx. 90% degraded by day 70 (under controlled composting conditions) (SUNPAP 2012). Using EN 14046, >60% degradation of CNF- products (concentrated CNF granules, paper with 1.5% CNF additive, CNF film) after 65 days – 76%, 95%, and 100%, respectively (Vikman et al. 2014). Cellulose fibers readily biodegradable: Using ISO 14855-1999 and EN 14046-2003, complete degradation by 25 days (Fernandes et al. 2011). Using EN14046 cellulose powder and Whatman cellulose paper were >60% after 28 days, and 82% and 69% after 65 days (Vikman et al. 2014).
12.3 Bioaccumulative potential	No data available.
12.4 Mobility in soil	No data available.
12.5 PBT/vPvB assessment	No data available.
12.6 Other adverse effects	No data available.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

All components are derived from natural materials and not anticipated to require specific handling for disposal. Avoid dust generation upon disposal. Not specifically listed as a hazardous waste under Transport of Dangerous Goods Act (TDG) or the U.S. Resource Conservation and Recovery Act (RCRA). However, if waste exhibits one or more of the following characteristics: ignitability, corrosivity, reactivity, or toxicity as described by 40 CFR 261.21-24, then waste must be classified as hazardous. At present, no nano-specific regulations exist. Waste must be disposed of in accordance with federal, provincial/state, and local environmental control regulations.

SECTION 14: Transport information

14.1 UN number: None

14.2 UN proper shipping name: Not applicable

14.3 Transport hazard class: Not applicable

14.4 Packing group: Not applicable

14.5 Environmental hazards: Not classified as hazardous to the environment

14.6 Special precautions for user: No additional information available

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

Cellulose is not a DOT controlled material (United States).

SECTION 15: Regulatory information

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

None for CNF. For related substances, For related substances, see Section 8.

All components of this product are on the Domestic Substances List. This material is not listed as a Hazardous Product, as it is included in Non-Application of Part II in the Hazardous Products Act.

This material is not regulated under WHMIS 2015.

15.2 Chemical safety assessment: No chemical safety assessment has been carried out for this substance by the supplier.

SECTION 16: Other information

SDS preparation date: Insert data here

SDS last known revision date and changes made: Version #, Month, Year

SDS prepared by: Vireo Advisors, LLC. P.O. Box 51368, Boston, MA 02205 USA www.VireoAdvisors.com

SDS revised by: Vireo Advisors, LLC. P.O. Box 51368, Boston, MA 02205 USA www.VireoAdvisors.com

Other comments:

Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, for safe handling.

See ISO TR 13329.

NFPA Rating (based on cellulose dust):

Health 1; Flammability 1; Reactivity 0; Special information 0

NOTE:

The information in the safety data sheet should be provided to all who will use, handle, store, transport or otherwise be exposed to this product. All information concerning this product and/or suggestions for handling and use contained herein are offered in good faith and are believed to be reliable as of the date of publication. No warranty is made regarding the accuracy of and/or sufficiency of such information. Nothing contained herein shall be construed as granting or extending any license under any patent. If the date on this document is more than three years old, call to ensure that this sheet is current.