SAFETY DATA SHEET
Product: Boron Nitride Nanotubes (BNNT)

(1) PRODUCT AND COMPANY IDENTIFICATION

Identification of the substance or preparation

TRADE/MATERIAL NAME: Boron Nitride Nanotubes (BNNT)
CHEMICAL NAME: Boron Nitride Nanotubes (BNNT)

This SDS is valid for the following Graphene Grades: BNNT-R, BNNT-P

Use of the substance/Preparation: For laboratory research and commercial development purposes only.

Supplier:
Raymor Industries Inc.
3765 La Vérendrye
Boisbriand, Quebec, J7H 1R8
CANADA
Phone No.: +1 450.434.6266

Emergency Telephone:
1-888-CANUTEC (226-8832) (North American use) and/or
1-613-996-6666 (International use)

(2) HAZARDS IDENTIFICATION (EC)

GHS Classification
Not available

GHS Label elements, including precautionary statements

Signal Word: Warning

WHMIS Classification
Not available

Precautionary statement(s):
Keep container tightly closed. Prevent dust accumulation.

HMIS Classification
Health hazard: 2
Flammability: 0

Physical hazards: 0
Potential Health Effects:

Inhalation May be harmful if inhaled.
Causes respiratory tract irritation.
Skin May be harmful if absorbed through skin.
Causes skin irritation.
Eyes: Causes eye irritation.
Ingestion May be harmful if swallowed.

Hazard codes: Xi

Risk Statements: R36/37/38

(3) COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT NAME	CAS NUMBER	PERCENT
Boron Nitride; (app 60% BNNT, app 10% hexagonal Boron Nitride)	10043-11-5	60-99
BNH derivatives	Not available	0-40
Boron	7440-42-8	1-25

(4) FIRST AID MEASURES

Eye contact:	Dust in the eyes: Do not rub eyes. Immediately flush eye(s) with plenty of water. Remove contact lenses, if present and easy to do. If irritation occurs, get medical assistance.
Skin contact:	Contact with dust: Wash area with soap and water. Get medical attention if irritation develops or persists.
Inhalation:	Dust irritates the respiratory system, and may cause coughing and difficulties in breathing. If symptomatic, move to fresh air. Get medical attention if discomfort develops or persists.
Ingestion:	Rinse mouth thoroughly if dust is ingested. Get medical attention if symptoms occur.

(5) FIRE-FIGHTING MEASURES

Conditions of flammability:	Not flammable or combustible.
Suitable extinguishing media:	Water fog, carbon dioxide, dry chemical, foam.
Decomposition products:	Carbon monoxide, carbon dioxide and metal oxide .
Special protective equipment for fire-fighters:	Wear self-contained breathing apparatus if the fire is large.

(6) ACCIDENTAL RELEASE MEASURES

Personal precautions:	Wear protective equipment. Keep unprotected persons away. Ensure adequate ventilation.
Environmental precautions:	Keep spilt material away from drains and runoff, ground-water and soil.
Methods for clean-up:	Collect spilled material using a vacuum with HEPA filter. Avoid formation of dust.

(7) HANDLING AND STORAGE

Handling:	Ensure good ventilation of the workplace. Avoid dust formation. Keep work areas clean and free of waste. Avoid contact with skin and eyes. Observe good industrial hygiene practices.
Storage:	Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use.

(8) EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values:

Occupational Safety and Health Administration Permissible Exposure Limit (OSHA PEL; United States).
No data available

Occupational exposure controls:

Install and operate general and/or local exhaust ventilation systems of sufficient power to maintain airborne concentration below the defined or recommended limit. If possible, manipulate under fume hood to avoid exposure. Provide easy access to water supply and eye wash facilities.

Respiratory protection:

Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard, such as NIOSH (US) or EN 143 (EU). Respirator selection must be based on known or anticipated exposure levels, the hazards of the material, and the safe working limits of the selected respirator. For little exposure, use type P95 (NIOSH) or type P1 (EN 143) respirators. For high exposure, use type P99 (NIOSH) or type P2 (EN 143) respirators. For further details, please consult the following ISO documents ISO/TS 12901-1:2012: Occupational risk management applied to engineered nanomaterials -- Part 1: Principles and approaches, as well as ISO/TS 12901-2:2014 : Occupational risk management applied to engineered nanomaterials -- Part 2: Use of the control banding approach.

Hand protection:

Handle with protecting gloves. Wash and dry hands after manipulation.

Eye protection:

Wear safety glasses conforming to an approved standard, such as NIOSH (US) or EN 166 (EU).

Skin protection:

Wear protective clothing to prevent contact with skin. The type of clothing must depend on the level of exposure to the product.

(9) PHYSICAL AND CHEMICAL PROPERTIES

General Information: Appearance – white to light grey powder
Odour – None

Important health, safety and environmental information:

Physical form:	Solid
pH:	Not applicable.
Boiling point:	Not available.
Flash point:	Not available.
Explosive properties:	Not available.
Oxidising properties:	Not expected.
Vapour pressure:	Not applicable.
Relative density:	Not available.
Solubility:	Not available.
Partition coefficient:	Not applicable.
Viscosity:	Not applicable.
Vapour density:	Not applicable.
Evaporation rate:	Not applicable.
Stability in air:	>850 °C

Other Information:

Melting point:	2973 °C (5383.4 °F)

(10) STABILITY AND REACTIVITY

This product is stable under normal storage conditions.

Conditions to avoid: Avoid dust formation

Materials to avoid: Oxidising and reducing agents.

Hazardous decomposition products: Boron oxides, Boric acid, nitrogen compounds (ammonia possible)

(11) TOXICOLOGICAL INFORMATION

This product contains engineered nanoparticles which have structural features with at least one dimension of 100 nanometers or less.

Acute toxicity:

BNNT (CAS: Mixture)
Oral LD50: LD50 Oral - rat - > 50 g/kg
Dermal LD50 : LD50 Dermal - rabbit - > 20 ml/kg

Other information on acute toxicity:
Boron (CAS 7440-42-8):
Oral LD50 : LD50 Oral - rat - 650 mg/kg

Irritant effect on skin:	Skin contact with BNNT powder may cause irritation.
Irritant effect on the eye:	Eye contact may cause irritation.
Respiratory or skin sensitization:	BNNT powder may cause skin sensitization.
Inhalation:	Inhalation can cause irritation.
Chronic inhalation:	Frequent inhalation of dust over a long period of time increases the risk of developing lung diseases.
Ingestion	May be harmful if swallowed.

Note: Information based on BN component of mixture. For BNNT component, acute and chronic toxicity of this substance is not known and is anticipated to be different based on morphology, i.e. few wall long and high wall number short BNNT are anticipated to have different toxicities.

(12) ECOLOGICAL INFORMATION

Ecotoxicity: The product is not classified as environmentally hazardous. However, as the BNNT component is a nanomaterial, use of Hazardous Materials Remediation companies are recommended for waste management and this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Mobility in environmental media : The product is insoluble in water and will sediment in water systems.

(13) DISPOSAL CONSIDERATIONS

The generation of waste should be avoided or minimised whenever possible. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Disposal of this product, and any by-product should at all times comply with the requirements of environmental protection and waste disposal legislation and any national, regional and local authority requirements.

(14) TRANSPORT INFORMATION

DOT (US):	Not regulated as a hazardous material by DOT
UN Number:	Not applicable
Shipping Name:	Not applicable
Class:	Not applicable
Packing Group:	Not applicable
Label:	Not applicable

(15) REGULATORY INFORMATION

WHMIS status: Non-controlled

Lists:	**Yes/No**
Canada	
Domestic Substances List (DSL)	**Yes**
Non-Domestic Substances List (NDSL)	**No**
Ingredient Disclosure List	**No**
US	
TSCA	**Yes**
SARA Tittle III, Section 313 Toxic Chemical List	**No**

EU REGULATIONS

Hazard Symbol:

Xi Irritant

Risk phrases:

R36/37/38 Irritating to eyes, respiratory system and skin.

Safety phrases:

S7 Keep container tightly closed.
S22 Do not breathe dust.
S29 Do not empty into drains.
S36/37/39 Wear suitable protective clothing such as a Tyvek suit with a hood, nitrile gloves and eye/face protection such as goggles. Wearing a positive atmosphere personal respirator (PAPR) equipped with P100 air filters is recommended.

(16) OTHER INFORMATION

NFPA Classification:	Not available.	
Full Text of R-phrases in Section 2 & 3:	R36/37/38	Irritating to eyes, respiratory system and skin.
Full Text of classification in Section 2 & 3:	Xi	Irritant
Date of Issue:	December, 2021	
Version:	1	
Date of previous issue:	April, 2017	

Notice:

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. The information contained herein was not obtained from toxicology assays using our graphene but gathered from literature.