

**1. Product and Company Identification**

**Material name** Boron Nitride Nanotubes (BNNT)  
**Version #** 03  
**Issue date** 04-29-2013  
**Revision date** 07-07-2014  
**Supersedes date** -  
**CAS #** Mixture  
**MSDS Number** BNNT - 001  
**Product use** Property Studies; Compositing; Biomedical; Functionalization; Filters; Thermal conductor  
**Manufacturer information**

BNNT, LLC  
300 Ed Wright Lane Suite A  
Newport News  
VA 23606 US  
info@bnnt.com  
http://www.bnnt.com  
Contact Person: R. Roy Whitney  
+1 757.369.1939

**Emergency****2. Hazards Identification**

**Physical state** Solid.  
**Appearance** The product looks like a ball of cotton or cotton yarn.  
**OSHA regulatory status** This product is hazardous according to OSHA 29 CFR 1910.1200.  
**Potential health effects**  
**Routes of exposure** Inhalation. Ingestion. Skin contact. Eye contact.  
**Eyes** Dust in the eyes will cause irritation.  
**Skin** Dust may irritate skin. Research on the dermal exposure of nanomaterials is ongoing.  
**Inhalation** Dust may irritate the respiratory system.  
**Ingestion** May cause discomfort if swallowed.  
**Target organs** Eyes. Skin. Respiratory system. Gastro-intestinal tract.  
**Chronic effects** Frequent inhalation of dust over a long period of time increases the risk of developing lung diseases.  
**Signs and symptoms** Causes eye irritation.  
**Potential environmental effects** The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**3. Composition / Information on Ingredients**

Components	CAS #	Percent
Boron Nitride; BNNT, LLC (50% BNNT, 50% hexagonal Boron Nitride)	10043-11-5	30-99
Boron	7440-42-8	1-50

**Composition comments** \* Typical value  
All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

**4. First Aid Measures****First aid procedures**

**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.

<b>Skin contact</b>	Contact with dust: Wash area with soap and water. Get medical attention if irritation develops or persists.
<b>Inhalation</b>	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.
<b>Ingestion</b>	Rinse mouth thoroughly if dust is ingested. Get medical attention if symptoms occur.
<b>Notes to physician</b>	Provide general supportive measures and treat symptomatically.
<b>General advice</b>	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

## 5. Fire Fighting Measures

<b>Flammable properties</b>	The product is non-combustible.
<b>Extinguishing media</b>	
<b>Suitable extinguishing media</b>	Use fire-extinguishing media appropriate for surrounding materials.
<b>Unsuitable extinguishing media</b>	None known.
<b>Protection of firefighters</b>	
<b>Specific hazards arising from the chemical</b>	None known.
<b>Protective equipment and precautions for firefighters</b>	Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace.
<b>Fire fighting equipment/instructions</b>	Use standard firefighting procedures and consider the hazards of other involved materials.

## 6. Accidental Release Measures

<b>Personal precautions</b>	Ensure adequate ventilation. Avoid inhalation of dust and contact with skin and eyes. Wear suitable protective clothing. See Section 8 of the MSDS for Personal Protective Equipment.
<b>Environmental precautions</b>	Avoid discharge into drains, water courses or onto the ground.
<b>Methods for cleaning up</b>	Avoid dust formation. Collect dust using a vacuum cleaner equipped with HEPA filter.

## 7. Handling and Storage

<b>Handling</b>	Use work methods which minimize dust production. Local exhaust is recommended. Avoid inhalation of dust and contact with skin and eyes. Wear appropriate personal protective equipment. Wash hands after handling. Observe good industrial hygiene practices.
<b>Storage</b>	Store in tightly closed original container in a well-ventilated place. Read and follow manufacturer's recommendations.

## 8. Exposure Controls / Personal Protection

<b>Occupational exposure limits</b>	No exposure limits noted for ingredient(s).
<b>Engineering controls</b>	Provide sufficient ventilation for operations causing dust formation. ACGIH: OELs (8-hour TLV-TWA) for inhalable dust: 10 mg/m <sup>3</sup> ; respirable dust 3 mg/m <sup>3</sup> . Observe occupational exposure limits and minimize the risk of exposure.  Provide easy access to water supply and eye wash facilities.
<b>Personal protective equipment</b>	
<b>Eye / face protection</b>	Wear dust-resistant safety goggles where there is danger of eye contact.
<b>Skin protection</b>	Wear protective gloves. Wear suitable protective clothing.
<b>Respiratory protection</b>	Use NIOSH/MSHA air purifying respirator if deemed necessary by industrial hygienist.
<b>General hygiene considerations</b>	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

## 9. Physical & Chemical Properties

<b>Appearance</b>	The product looks like a ball of cotton or cotton yarn.
<b>Physical state</b>	Solid.
<b>Form</b>	Boron Nitride Nanotubes which is a Nanomaterial with at least one dimension of <100 NM (nanometers).

<b>Color</b>	White to light grey.
<b>Odor</b>	Not applicable.
<b>pH</b>	Not applicable.
<b>Vapor pressure</b>	Not applicable.
<b>Vapor density</b>	Not applicable.
<b>Boiling point</b>	Not applicable.
<b>Melting point/Freezing point</b>	5383.4 °F (2973 °C)
<b>Solubility (water)</b>	Insoluble in water.
<b>Specific gravity</b>	2.29
<b>Flash point</b>	Not applicable.
<b>Flammability limit - upper (%) temperature</b>	Not applicable
<b>Flammability limit - lower (%) temperature</b>	Not applicable.
<b>Auto-ignition temperature</b>	Not applicable.
<b>VOC</b>	Not applicable.
<b>Evaporation rate</b>	Not applicable.
<b>Viscosity</b>	Not applicable.
<b>Partition coefficient (n-octanol/water)</b>	Not applicable.
<b>Bulk density</b>	Variable depending on if compacted (UNIT)
<b>Other data</b>	
<b>Decomposition temperature</b>	> 7232 °F (> 4000 °C)

## 10. Chemical Stability & Reactivity Information

<b>Chemical stability</b>	Stable at normal conditions.
<b>Conditions to avoid</b>	Avoid dust formation.
<b>Incompatible materials</b>	None known.
<b>Hazardous decomposition products</b>	Boron oxides. Nitrogen compounds.
<b>Possibility of hazardous reactions</b>	Will not occur.

## 11. Toxicological Information

### Toxicological data

Product	Species	Test Results
Boron Nitride Nanotubes (BNNT) (CAS Mixture)		
<b>Acute</b>		
<i>Dermal</i>		
LD	Rabbit	> 20 ml/kg
<i>Oral</i>		
LD	Rat	> 50 g/kg
Components	Species	Test Results
Boron (CAS 7440-42-8)		
<b>Acute</b>		
<i>Oral</i>		
LD50	Rat	650 mg/kg
<b>Sensitization</b>	No data available.	
<b>Acute effects</b>	May cause discomfort if swallowed. Causes severe eye irritation. May cause respiratory tract irritation.	
<b>Local effects</b>	Dusts may irritate the respiratory tract, skin and eyes. May be harmful if swallowed.	

<b>Chronic effects</b>	Frequent inhalation of dust over a long period of time increases the risk of developing lung diseases.
<b>Carcinogenicity</b>	No data available.
<b>Mutagenicity</b>	No data available.
<b>Reproductive effects</b>	No data available.
<b>Further information</b>	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. BN and BNNT are anticipated to have different toxicities.

## 12. Ecological Information

<b>Ecotoxicity</b>	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.
<b>Persistence and degradability</b>	No data available.
<b>Bioaccumulation / Accumulation</b>	No data available.
<b>Mobility in environmental media</b>	The product is insoluble in water and will sediment in water systems.

## 13. Disposal Considerations

<b>Disposal instructions</b>	Avoid discharge into water courses or onto the ground. Dispose in accordance with all applicable regulations.
<b>Waste from residues / unused products</b>	Dispose of waste and residues in accordance with local authority requirements.
<b>Contaminated packaging</b>	Dispose of in accordance with local regulations. Empty containers should be taken to an approved waste handling site for recycling or disposal.

## 14. Transport Information

### DOT

Not regulated as a hazardous material by DOT.

### IATA

Not regulated as dangerous goods.

### IMDG

Not regulated as dangerous goods.

### TDG

Not regulated as dangerous goods.

## 15. Regulatory Information

**US federal regulations** This product is hazardous according to OSHA 29 CFR 1910.1200. All components are on the U.S. EPA TSCA Inventory List.

CERCLA/SARA Hazardous Substances - Not applicable.

### TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

### Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

### CERCLA (Superfund) reportable quantity (lbs) (40 CFR 302.4)

None

### Superfund Amendments and Reauthorization Act of 1986 (SARA)

#### Hazard categories

Immediate Hazard - Yes  
 Delayed Hazard - No  
 Fire Hazard - No  
 Pressure Hazard - No  
 Reactivity Hazard - No

<b>Section 302 extremely hazardous substance (40 CFR 355, Appendix A)</b>	No
<b>Section 311/312 (40 CFR 370)</b>	Yes
<b>Drug Enforcement Administration (DEA) (21 CFR 1308.11-15)</b>	Not controlled
<b>WHMIS status</b>	Non-controlled

#### Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

\*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s)

**State regulations** This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

#### **US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance**

Not listed.

#### **US - New Jersey RTK - Substances: Listed substance**

Boron (CAS 7440-42-8) Listed.

#### **US. Massachusetts RTK - Substance List**

Not regulated.

#### **US. New Jersey Worker and Community Right-to-Know Act**

Not regulated.

#### **US. Pennsylvania RTK - Hazardous Substances**

Not regulated.

## 16. Other Information

**Further information** HMIS® is a registered trade and service mark of the NPCA.

**HMIS® ratings**  
 Health: 2  
 Flammability: 0  
 Physical hazard: 0

**NFPA ratings**  
 Health: 2  
 Flammability: 0  
 Instability: 0

**Disclaimer** The information in this MSDS was obtained from sources which we believe are reliable, but no warranty or representation as to its accuracy or completeness is hereby given. Users should consider the information herein only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal, the safety and health of employees and customers and the protection of the environment.