

Material Safety Data Sheet

acc. to OSHA and ANSI

Revision date 7/3/2012

Product restricted to laboratory research and development uses.

1 Identification of substance:

- **Product Identifier:** Multi-Walled Carbon Nanotube Dispersion
- **Trade name:** Carbon Nanotube Dispersion, CNT, Multi-Walled CNT(Generic), N-methyl-2-pyrrolidone (NMP)
- **Stock number:**
- **Manufacturer/Supplier:**
Nanostructured & Amorphous Materials, Inc.
16840 Clay Road, Suite #113
Houston, TX 77084, USA

2 Composition/Data on components:

- **Chemical characterization:**
Description: (CAS#)
Multi-Walled CNT 3% (CAS # - NA)
N-methyl-2-pyrrolidone balance (CAS # 872-50-4)

3 Hazards identification

- **Hazard description:** Xi Irritant
- **Eye Contact:** May cause eye irritation
- **Skin Contact:** May cause sensitization by prolonged skin contact.
- **Inhalation:** Potentially toxic for humans if inhaled of NMP steam.
- **Ingestion:** Lower oral acute toxicity, but may irritate gastrointestinal tract

4 First aid measures

- **Skin contact:** Rinse with water and soap
- **Eye contact:** Rinse with water. Obtain medical attention if pain, blinking or redness persists
- **Ingestion:** Rinse mouth with water. Don't be treatment for vomiting. Seek immediate medical advice.

5 Fire fighting measures

- **Flash Point:** 91 °C (196 °F) - closed cup (NMP)
- **Explosion Limits:** Unknown
- **Fire extinguishing:** Powder, carbon-rich gas, foam fire-extinguisher, drying sand, Water (spray)

6 Accidental release measures

- **After release:**
Adequate ventilation should be provided in the storage area.
Wear Safety glasses, impervious gloves, gas mask while working.
Keep away from sources of ignition.
- **Measures for environmental protection:**
Do not allow material to be released to the environment without proper governmental permits.
- **Measures for cleaning/collecting:** Ensure adequate ventilation.
- **Additional information:**
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

- **Handling:**
Provide good ventilation and an exhaust system in the work area. In case of insufficient ventilation, wear suitable respiratory equipment
- **Information for safe handling:**
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
- **Information about protection against explosions and fires:**
Keep away from sources of ignition.
- **Storage:**
- **Requirements to be met by storerooms and receptacles:**
No special requirements.
- **Information about storage in one common storage facility:**
Store away from oxidizing agents.
Store away from halogens.
Do not store together with acids.
- **Further information about storage conditions:**
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.

8 Exposure controls and personal protection

- **Additional information about design of technical systems:**

Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Components with limit values that require monitoring at the workplace:

Graphite	
	mg/m3
ACGIH TLV	2
Belgium TWA	2.5
Finland TWA	5
France VME	2
Germany MAK	6
Ireland TWA	5
Korea TLV	2
Netherlands MAC-TGG	2
Poland TWA	2
Sweden NGV	5 (dust)
Switzerland MAK-W	2.5
United Kingdom	5-LTEL
USA PEL	15 mppcf

- **Additional information:** No data
- **Personal protective equipment**
- **General protective and hygienic measures**
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Avoid contact with the eyes.
Avoid contact with the eyes and skin.
- **Breathing equipment:**
Use suitable respirator when high concentrations are present.
- **Protection of hands:** Impervious gloves
- **Eye protection:** Safety glasses
- **Body protection:** Protective work clothing.

9 Physical and chemical properties:

- **General Information**
- **Form:** Black Liquid
- **Color:** Black
- **Odor:** Odorless
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- **Change in condition**

Value/Range Unit Method

- **Melting point/Melting range:** -24 °C (-11 °F) (subl/vac)
- **Boiling point/Boiling range:** 202 °C (396 °F)
- **Sublimation temperature / start:** Not determined
- **Flash point:** 91 °C (196 °F) - closed cup
- **Ignition temperature:** 270 °C (518 °F)
- **Decomposition temperature:** Not determined
- **Danger of explosion:**
Product can present an explosion hazard.
- **Explosion limits:**
- **Lower:** 1.3 % (V)
- **Upper:** 9.5 % (V)
- **Vapor pressure:**
0.39 - 0.43 hPa (0.29 - 0.32 mmHg) at 20 °C (68 °F)
1.32 hPa (0.99 mmHg) at 40 °C (104 °F)
- **Density:** 1.028 g/mL at 25 °C (77 °F)
- **Solubility in / Miscibility with**
- **Water:** Not Determined

10 Stability and reactivity

- **Thermal decomposition / conditions to be avoided:**
Unstable, avoid Sunlight, heat, open flame, high-temperature, spark, static, or other ignition source
- **Materials to be avoided:**
Contact with strong oxidizing agents, strong acid, reducing agents, bases.
- **Dangerous reactions** No dangerous reactions known if store under recommended conditions
- **Dangerous products of decomposition:** Carbon monoxide and carbon dioxide

11 Toxicological information

- **Acute toxicity CNT:**
Primary irritant effect:
 - on the skin: Irritant to skin and mucous membranes.
 - on the eye: Irritating effect.**Sensitization:** No sensitizing effects known.

- **Acute toxicity NMP:**
ORL-RAT LD50 3914 mg kg-1
ORL-MUS LD50 7725 mg kg-1
IPR-RAT LD50 2266 mg kg-1
SKN-RBT LD50 8000 mg kg-1
Irritating to eyes.
Irritating to respiratory system.
Irritating to skin.
- **Sub-acute to chronic toxicity:**
The inhalation of graphite, both natural and synthetic, has caused pneumoconiosis in exposed workers. The pneumoconiosis found is similar to coal worker's pneumoconiosis.
- **Additional toxicological information:**
To the best of our knowledge the acute and chronic toxicity of carbon nanotubes is not fully known.
No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

12 Ecological information:

- **General notes:**
Do not allow material to be released to the environment without proper governmental permits.

13 Disposal considerations

- **Product:**
- **Recommendation**
Consult state, local or national regulations to ensure proper disposal.
- **Unclean packaging:**
- **Recommendation:**
Disposal must be made according to official regulations.

14 Transport information

Use precaution during transport in order to prevent accidental spill. Store in a cool place avoiding direct sunlight when transportation.

- **DOT regulations:**
NA-Number: 1993 Class: CBL Packing group: III
Proper shipping name: Combustible liquid (N-methyl-2-pyrrolidone)
Reportable Quantity (RQ):
Marine pollutant: No
Poison Inhalation Hazard: No
- **Hazard class:** None

- **Land transport ADR/RID (cross-border)**
- **ADR/RID class:** None
- **Maritime transport IMDG:**
- **IMDG Class:** None
- **Air transport ICAO-TI and IATA-DGR:**
- **ICAO/IATA Class:** None
- **Transport/Additional information:**
Not dangerous according to the above specifications.

15 Regulations

- **Product related hazard informations:**
- **Hazard symbols:** Xi Irritant, Combustible Liquid, Target Organ Effect, Teratogen
- **Risk phrases:** Irritating to eyes and respiratory system.
- **Safety phrases:**
In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- **National regulations**
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical Substance Inventory.
- **Information about limitation of use:**
For use only by technically qualified individuals.

16 Other information:

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.