

SAFETY DATA SHEET (SDS)

Product: Semiconducting Single-Wall Carbon nanotubes in aqueous solution

(1) PRODUCT AND COMPANY IDENTIFICATION

TRADE/MATERIAL NAME: IsoNanotubes-S
CHEMICAL NAME: Semiconducting single-walled carbon nanotubes

This SDS is valid for the following SWCNT Grades: IsoNanotubes-S90, 95, 99, 99.9%

Use of the substance/Preparation: For laboratory research purposes.

Supplier: NanoIntegris Technologies Inc,
c/o Raymor Industries Inc.
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Boisbriand, Quebec, J7H 1R8
CANADA
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1-800-262-8200 (within the U.S.)
+1 703-741-5500 (Worldwide)

Date prepared: September 6th, 2018

(2) HAZARDS IDENTIFICATION (EC)

OSHA Defined Hazard
Irritant

GHS Classification
Eye irritation (Category 2A)
Specific target organ toxicity - single exposure (Category 3)

GHS Label elements, including precautionary statements



Signal Word: Warning

Hazard statement(s)

H319 Causes serious eye irritation.
H335 May cause respiratory irritation.

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Precautionary statement(s)

P261 Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

(3) COMPOSITION/INFORMATION ON INGREDIENTS

Components are listed in compliance with OSHA's 29 CFR 1910.1200.

<u>INGREDIENT NAME</u>	<u>CAS NUMBER</u>	<u>WEIGHT PERCENT</u>
<u>Water</u>	7732-18-5	> 99%
<u>carbon nanotubes</u>	7782-42-5	< 0.01 %
<u>Surfactant</u>	361-09-1 151-21-3	< 1 %
<u>Mixture of Nickel and</u>	7440-02-0	<0.0005 %
<u>Iron and</u>	7439-89-6	
<u>Cobalt</u>	7440-48-4	

(4) FIRST AID MEASURES

Eye contact: Immediately flush eyes gently and thoroughly, including under the eyelids, with clean running water for 20 minutes. Remove contact lenses if present after the first 5 minutes and continue flushing for several more minutes.

Skin contact: Wash thoroughly with soap and water. If irritation develops and persists, seek medical attention.

Inhalation: Remove victim to fresh air. Restore and/or support breathing as needed. Seek medical attention.

Ingestion: Rinse mouth. Call poison control centre or local physician. Do NOT induce vomiting.

(5) FIRE-FIGHTING MEASURES

Suitable extinguishing media: Water fog, carbon dioxide, dry chemical, foam.

Decomposition products: Carbon monoxide and carbon dioxide

Special protective equipment for fire-fighters: Wear NIOSH-approved self-contained breathing apparatus (SCBA) if the fire is large.

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(6) ACCIDENTAL RELEASE MEASURES

- Personal precautions: Wear protective equipment. Keep unprotected persons away. Ensure adequate ventilation. Keep away from ignition sources. Prevent the formation of dust-air mixture.
- Environmental precautions: Keep spilt material away from drains and runoff, ground-water and soil.
- Methods for clean-up: Contain and collect liquid with an inert absorbent and place in a container for disposal. Clean spill area thoroughly with soap and water. Report spills to authorities as required.

(7) HANDLING AND STORAGE

- Handling: Minimize breathing of vapours and avoid prolonged or repeated contact with skin. Wear proper protective equipment. If ventilation is not efficient, wear proper respiratory equipment. Detailed information on handling carbon nanotubes may be found in the ASTM Standard E 2535-07, "Standard Guide for Handling Unbound Engineered Nanoscale Particles in Occupational Settings," ASTM International. Ensure good ventilation of the workplace. Avoid dust formation. Keep work areas clean and free of waste. Avoid contact with skin and eyes.
- Storage: Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Store away from strong oxidizing and reducing agents. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.

(8) EXPOSURE CONTROLS/PERSONAL PROTECTION

- Exposure limit values for dry carbon nanotubes: NIOSH Exposure Limit Value : 0.01 mg/m³ (ACGIH)
 OSHA (PEL): No occupational limits established.
 German Maximale Arbeitsplatzkonzentration (MAK) : 6 mg/m³
 British Occupational Exposure Limit (OEL) : 3.5 mg/m³
 Italian Exposure Limit: 3.5 mg/m³ TWA; * 7 mg/m³ STEL**
 NEDO Projet "Research and Development of Nanoparticle Characterization Methods" : 0.03 mg/m³ (based on a 4 week test with full-body inhalation by Nakanishi et al., 2011).

* Time-weighted average ** Short-term exposure limit

- Personal Protection In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.
- 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 (such as NIOSH exposure limit value). If possible, manipulate under fume hood to avoid exposure.
- Hand protection: Handle with chemical resistant gloves. Wash with soap and dry hands after

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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 in accordance with OSHA dermal protection requirements at 29 CFR 1910.132, 1910.133 and 1910.138. The type of clothing must depend on the level of exposure to the product.

(9) PHYSICAL AND CHEMICAL PROPERTIES

General Information: Appearance – Solution: IsoNanotubes-S (Pink),
Odour – Mild soap scent

Important health, safety and environmental information:

pH: Not applicable.
Boiling point: ~ 100 °C
Flash point: ~ 120 °C at 1.1 atmospheres
Explosive properties: Not available
Oxidising properties: Not expected.
Vapour pressure: ~18.7 mm Hg at 21 °C
Solubility in water: Complete
Partition coefficient: Not applicable.
Evaporation rate: ~1.958x10⁻⁴ at 21°C
Specific gravity: ~1.0 at 21°C

Other Information:

Melting point: ~ 0.0 °C

(10) STABILITY AND REACTIVITY

This product is stable under normal storage conditions.

Conditions to avoid: Ignition source.

Materials to avoid: Oxidising and reducing agents.

Hazardous decomposition products: Under fire conditions: carbon monoxide and carbon dioxide.

(11) TOXICOLOGICAL INFORMATION

Acute toxicity:

Irritant effect on skin: Skin contact with carbon nanotubes may cause irritation.
Irritant effect on the eye: Eye contact has shown irritation.
Inhalation: Inhalation can cause irritation.
Ingestion: May be harmful if swallowed.

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Delayed (chronic and subchronic) toxicity:

Chronic effects on humans: Pure SDS powder has the following known Mutagenic Effects: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: skin.

Genotoxicity: *In vitro*: Carbon nanotubes have the following known Mutagenic Effects: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: skin.

In vivo: No formation of micronucleus (NEDO project, Nakanishi *et al*, 2011).

Carcinogenicity and Teratogenicity: To our knowledge, this product is not considered teratogenic. CNTs are not listed by NTP, IARC or OSHA as carcinogen/potential carcinogen.

(12) ECOLOGICAL INFORMATION

No known significant effects or critical hazards.

(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

Hazard Classes: This material is not defined under US DOT regulations as a hazardous substance.

UN Number: Not applicable

Shipping Name: Not applicable

Class: Not applicable

Packing Group: Not applicable

Label: Not applicable

ICAO/IATA Classification: This material is not defined under the US DOT regulations, "Dangerous Chemicals Management Ordinance," or Dangerous Goods Regulations (DGR), and is suitable for all normal transport by air, ground, rail, or water ways.

RID/ADR Classification: This material is not classified as Dangerous Goods in the hazard communication tool (GHS) or transport conditions (TDG) by the United Nations Economic Commission for Europe (UNECE) and is suitable for all modes of transport.

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(15) REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the Hazardous Products Regulations (HPR) and the SDS contains all the information required by the HPR.

(16) OTHER INFORMATION

Hazard statement(s)

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Precautionary statement(s)

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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 single-wall carbon nanotubes but gathered from literature.