

Safety Data Sheet (SDS)
AC100 Aqueous Ink
Single-wall Carbon Nanotube Ink



SECTION 1 PRODUCT IDENTIFICATION

PRODUCT NAME: Single-wall Carbon Nanotube Aqueous Ink, Aqueous Ink, AC100

OTHER/GENERIC NAMES: SWNT Ink, SWCNT Ink, Single-Wall Carbon Nanotube Ink

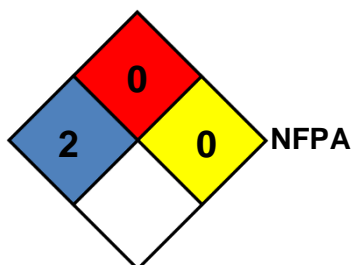
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PRODUCT USE: One or more components in this material have been approved for specific commercial uses under a US EPA TSCA Consent Order, apart from its non-restricted R&D use. Refer to section 15 for approved commercial uses and limitations/restrictions on its use.

SECTION 2 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Product is an aqueous dispersion. May cause eye, skin and respiratory tract irritation. The complete physical and toxicological properties of this material have not been fully evaluated.



Health Hazard	②	HMIS
Fire Hazard	①	
Reactivity	①	

OSHA HAZARDS: Harmful by ingestion. Toxic by skin absorption. Irritant. Target organ effect.

GHS LABEL ELEMENTS

PICTOGRAMS



SIGNAL WORD

Warning

HAZARD STATEMENT(S)

H315 Causes skin irritation

H319 Causes serious eye irritation

H335 May cause respiratory irritation

H402 Harmful to aquatic life

PRECAUTIONARY STATEMENT(S)

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

POTENTIAL HEALTH HAZARDS

SKIN: May cause skin irritation.
EYES: Causes eye irritation.
INHALATION: Vapors and mists from this material may cause nausea and irritation to the mucous membranes and upper respiratory tract. The product, if dried to a powder, presents an increased inhalation hazard because of the small particle size.
INGESTION: Not a probable route of exposure. This material may be harmful if swallowed (e.g. unintentional hand-to-mouth transfer).
DELAYED EFFECTS: None known.

Ingredients found on one of the OSHA designated carcinogen lists are listed below.

INGREDIENT NAME	NTP STATUS	IARC STATUS	OSHA LIST	ACGIH STATUS
Cobalt Compounds	Group 2 ²	2B ³	None	A3 ⁴

² Reasonably anticipated to be human carcinogens

³ Possibly carcinogenic to humans

⁴ Confirmed animal carcinogen with unknown relevance to humans

SECTION 3 COMPOSITION AND INFORMATION ON INGREDIENTS

INGREDIENT NAME ¹	CAS NUMBER	WEIGHT %
Water	7732-18-5	≥98
Sodium Dodecyl Sulfate	151-21-3	0.1-2
Single-Wall Carbon Nanotubes	NA	≤0.1
Impurities (including Silicon, Molybdenum and Cobalt, plus their Oxides or Carbides)	Various	<15ppm

This material is considered as hazardous under OSHA regulations.

¹ Trace impurities and additional material names not listed above may also appear in Section 15 towards the end of the SDS. These materials may be listed for local "Right-To-Know" compliance and for other reasons.

SECTION 4 FIRST AID MEASURES

GENERAL: Contaminated clothing should be removed and washed before reused.
SKIN: Wash with soap and water. Get medical attention if irritation develops or persists.
EYES: Flush eyes with plenty of water for at least 15 min. Get medical attention if irritation develops or persists.
INHALATION: Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if irritation develops or persists.
INGESTION: If person is conscious, rinse mouth with water. Do not induce vomiting unless directed to do so by a physician. Get medical attention immediately.
ADVICE TO PHYSICIAN: No specific advice, treat symptomatically.

SECTION 5 FIRE FIGHTING MEASURES

SUITABLE EXTINGUISHING MEDIA:

Water, Carbon Dioxide, Dry Chemical or Alcohol-Resistant Foam.

DECOMPOSITION PRODUCTS:

Carbon Monoxide, Carbon Dioxide and Sulfur & Sodium Oxides, according to the surfactant in use.

UNUSUAL FIRE & EXPLOSION HAZARDS:

Airborne dust from the dried dispersion in an enclosed space and in the presence of an ignition source may constitute an explosion hazard.

Sealed container may rupture when heated.

SPECIAL FIRE FIGHTING PRECAUTIONS/INSTRUCTIONS:

As in any fire, wear NIOSH/MSHA approved positive pressure self-contained breathing apparatus and full protective clothing, as combustion may produce hazardous fumes.

SECTION 6 ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE:

Use appropriate personal protection during clean up (Section 8). Keep unprotected personnel away.

Do not breathe product mist. If product dried to a powder, avoid inhalation of the dried powder, fume and vapor as well as skin or eye contact.

Remove mechanically by a method that minimizes the generation of airborne dust (HEPA equipped vacuum, wet mopping, etc.).

Absorb with inert absorbent material and place in appropriate containers for disposal. Do not allow spilled material or wash water to enter sewers, surface water, or ground water. Refer to section 13 for disposal information.

Spills and releases may have to be reported to Federal and/or local authorities. See Section 15 regarding reporting requirements.

SECTION 7 HANDLING AND STORAGE

NORMAL HANDLING:

Always wear recommended personal protective equipment (Section 8).

Avoid splashing or misting of products. Avoid contact with eyes and skin. Do not breathe product vapor or mist.

Keep in tightly closed containers. Additional sealing may prevent accidental product release.

Use local exhaust or general room/dilution ventilation sufficient to maintain exposure below permissible exposure limits (29 CFR 1910.1001 for asbestos). If possible, use in a closed, well-ventilated area (e.g. fume hood).

STORAGE RECOMMENDATIONS:

Store product in tightly closed containers, in a dry and well ventilated place. Do not expose to extreme heat or cold. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

SECTION 8 EXPOSURE CONTROLS AND PERSONAL PROTECTION⁵

EXPOSURE GUIDELINES

INGREDIENT NAME	ACGIH TLV ⁶	OSHA PEL ⁷	OTHER LIMIT
Single-Wall Carbon Nanotubes	Not Available	TWA ⁸ = 5mg/m ³	TWA = 7 µg/m ³ (respirable) ^{9,8}
Insoluble Molybdenum Compounds, as Mo	TWA = 10 mg/m ³ (inhalable) TWA = 3 mg/m ³ (respirable)	TWA = 10 mg/m ³ (total dust)	None
Cobalt Compounds, as Co	TWA = 0.02 mg/m ³	TWA = 0.05 mg/m ³	15 µg /L urine ¹⁰ , 1 µg/L blood
Sodium Dodecyl Sulfate (SDS)	NA ¹¹	NA	NA

⁵ Detailed information on handling carbon nanotubes may be found at the ASTM Standard E2535-07 "Std guide for Handling Unbound Engineered Nano-Scaled Particles in Occupational Settings" www.astm.org

⁶ Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted

⁷ PEL values represent limits established by the 1989 Air Contaminants Rule (29 CFR 1910.1000, Subpart Z, Table Z-1-A) which was subsequently revoked on June 30, 1993. Several states continue to enforce Table Z-1-A limits

OSHA Permissible Exposure Limits (PELs) are 8-hour TWA (time-weighted average) concentrations unless otherwise noted.

⁸ NIOSH Docket Number 161-A, "Occupational Exposure to Carbon Nanotubes and Nanofibers", November 2010

⁹ NIOSH REL

¹⁰ Biological Exposure Index (ACGIH)

ENGINEERING CONTROLS:

General room ventilation is adequate for storage and ordinary handling. Use local exhaust at points of use to maintain exposure below the PEL/TLV exposure limits.

PERSONAL PROTECTIVE EQUIPMENT



SKIN PROTECTION:

The product is a dispersion of SWCNT's in water where the CNT substance is solubilized. Therefore, gloves should be used that are comprised of material that successfully passes ASTM F-739 (continuous liquid contact method).

Gloves must be inspected prior to use and changed before they show degradation and before the designated breakthrough time for the carrier liquid (as determined by the ASTM F-739 testing or by the manufacturer). Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product.

Wear full body clothing, impervious to the product.

EYE PROTECTION:

Wear chemical goggles that conform to ANSI Z87.1 (US) or EN166 (EU) under normal conditions. Wear a full-face shield if there is a potential for contact with splashed material.

RESPIRATORY PROTECTION:

If there is potential for inhalation of dust or vapors wear a full-face NIOSH approved respirator with multipurpose combination (US) or type ABEK (EN 14387) cartridges or better.

The respirator must be selected based on contamination levels and use conditions found in the workplace. Use conditions must not exceed the working limits of the respirator. The respirator must be used in accordance with the OSHA respiratory protection standard (29 CFR 1910.134).

HYGIENE MEASURES:

Keep away from foodstuffs, beverages and feed. Remove all soiled and contaminated material immediately. Wash hands before breaks and at the end of work.

ADDITIONAL RECOMMENDATIONS:

Provide safety showers and eyewash stations in close proximity to the work area.

OTHER EXPOSURE LIMITS FOR POTENTIAL DECOMPOSITION PRODUCTS: None.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Black liquid
PHYSICAL STATE:	Aqueous dispersion
ODOR:	None
SPECIFIC GRAVITY (water = 1.0):	~1
SOLUBILITY IN WATER (weight %):	Miscible
pH:	various
BOILING POINT:	>100°C
MELTING POINT:	<0°C
% VOLATILES:	NA (≥98% water)
FLASH POINT¹²:	Not determined

¹² Flash point method and additional flammability data are found in Section 5

SECTION 10 STABILITY AND REACTIVITY

THERMAL DECOMPOSITION/CONDITIONS TO AVOID

Normally stable. Decomposition will not occur if used and stored according to specifications

INCOMPATIBILITIES/MATERIALS TO AVOID:

Strong oxidizing agents, acids, halogens, interhalogens, alkali metals.

HAZARDOUS DECOMPOSITION PRODUCTS:

Thermal decomposition products may include carbon monoxide, carbon dioxide, sulfur and sodium oxides and oxides of metallic impurities (including molybdenum and cobalt).

HAZARDOUS POLYMERIZATION:

Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION¹³

IMMEDIATE (ACUTE) EFFECTS: No data available

DELAYED (SUBCHRONIC AND CHRONIC) EFFECTS: No data available

CARCINOGENICITY:

No component of this product present at levels greater or equal to 0.1% is identified as probable, possible or confirmed carcinogen by IARC, ACGIH, NTP and OSHA.

OTHER DATA:

None

¹³ Toxicological information on carbon nanotubes may be found at the website of International Council on Nanotechnology at <http://cohesion.rice.edu/centersandinst/icon/>.

SECTION 12 ENVIRONMENTAL INFORMATION¹⁴

TOXICITY: No data available

OTHER ADVERSE EFFECTS: An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Harmful to aquatic life.

¹⁴ Additional information on ecological harms due to the presence of carbon nanotubes may be found at the website of International Council on Nanotechnology at <http://cohesion.rice.edu/centersandinst/icon/>.

SECTION 13 DISPOSAL CONSIDERATIONS**RCRA**

Not classified as RCRA hazardous waste

OTHER DISPOSAL CONSIDERATIONS:

Except for small R&D samples (TSCA §5(h)(3), 40CFR 720.3 and 40CFR720.36), disposal of this product is not allowed by federal, state and local government regulations. The dispersion must be filtered to remove carbon nanotubes which are to be destroyed in hazardous waste incinerator and special care should be taken not to be released in the water. Contact a licensed professional waste disposal service to dispose of the filtrate.

NOTE: The information offered here is for the product as shipped. Use and/or alterations to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classification and the proper disposal method.

SECTION 14 TRANSPORTATION INFORMATION

US DOT HAZARD CLASS: Not regulated.

US DOT ID NUMBER: Not applicable.

For additional information on shipping regulations affecting this material, contact the information number found on Section 1.

SECTION 15 REGULATORY INFORMATION**TOXIC SUBSTANCES CONTROL ACT (TSCA)*****TSCA INVENTORY STATUS:***

This product contains a substance that is manufactured according to the terms of TSCA consent order, for PMN P10-0005 and should not be used for commercial purposes or in formulations used for commercial purposes, unless the recipient agrees in writing to comply with the requirements of the above consent order.

As an exemption, the product can be further distributed only after it has been reacted, incorporated into an article or otherwise rendered into a physical form or state.

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Containing a TSCA-exempt R&D substance, this product must be used by or directly under the supervision of technically qualified individual(s) as defined by TSCA, solely for R&D purposes.

For additional information on TSCA status, contact the information number found on Section 1.

OTHER TSCA ISSUES: None

DSL STATUS

This product contains the following components that are not on the Canadian DSL nor NDSL lists

INGREDIENT NAME	CAS-NO.
Carbon Nanotubes	NA

SARA TITLE III/CERCLA

SECTION 302 COMPONENTS: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

SECTION 311/312 HAZARD CLASS: Immediate (Acute) Health Hazard, Chronic Health Hazard (SDS)

SECTION 313 COMPONENTS: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, section 313.

CALIFORNIA PROP.65 COMPONENTS

This product does not contain any chemicals known to State of California to cause cancer, birth or any other reproductive effects.

STATE RIGHT-TO-KNOW

INGREDIENT NAME	CAS-NO.	STATE
Carbon Nanotubes	NA	
Sodium Dodecyl Sulfate	151-21-3	Massachusetts, Pennsylvania, New

ADDITIONAL REGULATORY INFORMATION

WHMIS CLASSIFICATION (CANADA): Not determined.

FOREIGN INVENTORY STATUS:

Single-Wall Carbon Nanotubes being one of product's components are listed on the following inventories

Australian (AICS)	Canadian (DSL)
Chinese (IECSC)	European (EINECS)
Japanese (ENCS)	Korean (KECI)

SECTION 16 OTHER INFORMATION

CURRENT ISSUE DATE: November 30, 2016

PREVIOUS ISSUE DATE February 3, 2016
September 9, 2012

CHANGES TO SDS FROM PREVIOUS ISSUE DATE ARE DUE TO THE FOLLOWING:

November 30, 2016: Updated section 2&3 order, updated logo and renamed document
February 3, 2016: Updated logo and manufacturer information
September 9, 2012: Specified the SWCNT ingredient used

OTHER INFORMATION: None.

DISCLAIMER:

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CAUTION! POTENTIAL HAZARDS OF THIS EXPERIMENTAL PRODUCT ARE UNKNOWN.

MANUFACTURED UNDER U.S. PATENT NOS. #6,333,016, #6,413,487, #6,955,800 AS WELL AS OTHER PENDING PATENT APPLICATIONS IN THE U.S. AND AROUND THE WORLD.