



Material Safety Data Sheet
Single Wall Carbon Nano Tube HV Ink
Single Walled Carbon Nanotube Dispersion

SECTION 1 PRODUCT IDENTIFICATION

PRODUCT NAME: V2Vi 100X

OTHER/GENERIC NAMES: SWNT; SWCNT, Single-Walled Carbon Nanotube dispersion, Carbon Nanotube containing HV Ink mixture

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SECTION 2 COMPOSITION AND INFORMATION ON INGREDIENTS

Ingredient Name	CAS Number	Weight %
Water	07732-18-5	0.5 - 15%
2-aminobutane	13952-84-6	60 - 95%
Co-solvent *	00071-23-8	40 - 5%
Carbon as single walled nano material		<0.1
Metallic impurities (including oxides of Silicon, Molybdenum and Cobalt)	Various	<15ppm

*May contain up to 40% total of the following co-solvents:

Surfactant	CAS #
ethanol	00064-17-5
2-propanol	00067-63-0
1-propanol	00071-23-8
2-butanol	00078-92-2

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

Carbon nano materials are considered as hazardous under OSHA regulations.

SECTION 3 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Product is an organics dispersion. May cause eye, skin and respiratory tract burns and irritation. Contains carbon nano material, the complete physical and toxicological properties of which have not been fully evaluated.

General information: use appropriate personal protective equipment (see section 8)

Potential Health Hazards

INHALATION: May be harmful if inhaled. Material extremely destructive to the tissue of 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.

SKIN: May be harmful if absorbed through the skin. Causes skin burns.

EYES: Causes eye burns.

INGESTION: Toxic if swallowed. Causes burns.

Dry powder residue may be harmful if swallowed.

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
Cobalt Compounds		2B	

SECTION 4 FIRST AID MEASURES

INHALATION: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Consult a physician.

SKIN: In case of contact, remove contaminated clothing immediately. Wash off with soap and plenty of water. Consult a physician.

EYES: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately, continue to rinse while transporting to hospital.

INGESTION: If swallowed do not induce vomiting. Get medical aid immediately. If the victim is fully conscious, give a cupful of water and rinse mouth. Consult a physician.

SECTION 5 FIRE FIGHTING MEASURES

FLASH POINT: -19 deg C closed cup

AUTO IGNITION TEMPERATURE: No data available

UPPER FLAME LIMIT (volume % in air): No data available

LOWER FLAME LIMIT (volume % in air): No data available

NFPA Rating: Health: 3; flammability: 3; reactivity: 0

DECOMPOSITION PRODUCTS: Carbon Monoxide, Nitrous Oxides; Carbon Dioxide, Water Vapor.

EXTINGUISHING MEDIA:

Use water spray, dry chemical, "alcohol resistant" foam, or carbon dioxide.

SPECIAL FIRE FIGHTING PRECAUTIONS/INSTRUCTIONS:

As in any fire, wear NIOSH/MSHA approved positive pressure self-contained breathing apparatus and full protective clothing.

SECTION 6 ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE:

(Always wear recommended personal protective equipment – see section 8)

For small spills, soak up with absorbent material then place in suitable container. Remove all sources of ignition. Use spark proof tools. Provide ventilation. Use water spray to cool and disperse vapors, protect personnel, and dilute spills to form nonflammable mixtures.

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, wash thoroughly after handling.)

Avoid splashing or misting; avoid inhalation of vapor or mist. Avoid contact with eyes and skin. Do not breathe product mist. Use in a well ventilated area. Avoid static discharges, ground and bond containers, use spark-proof tools. Keep containers tightly closed; empty containers retain residue (liquid and/or vapor) and can be dangerous, dispose of appropriately.

STORAGE RECOMMENDATIONS:

Keep container closed and away from ignition sources. Store in cool, dry, well ventilated area. Flammables area. Isolate from oxidizing materials and acids.

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. Facilities should be equipped with an eyewash and safety shower.

PERSONAL PROTECTIVE EQUIPMENT

EYE PROTECTION:

Wear chemical splash goggles that conform to ANSI Z87.1 under normal conditions. Wear a full-face shield if there is potential for contact with splashed material.

SKIN PROTECTION:

Chemical-resistant garments on arms and hands.

CLOTHING:

Wear appropriate protective clothing to prevent skin exposure.

RESPIRATORY PROTECTION:

If there is potential for inhalation of dust or vapors, wear a full-face NIOSH approved respirator with N100 cartridge 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).

ADDITIONAL RECOMMENDATIONS:

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

EXPOSURE GUIDELINES

INGREDIENT NAME	ACGIH TLV	OSHA PEL	OTHER LIMIT
n-butylamine	Skin – potential significant contribution to overall exposure by cutaneous route; 5 ppm ceiling	300 ppm IDLH	5 ppm ceiling; 115 mg/m ³ ceiling
2-propanol	200 ppm; 400 ppm STEL	400 ppm TWA; 980 mg/m ³ TWA; 2000 ppm IDLH	400 ppm TWA; 980 mg/m ³ TWA
Single Wall Carbon Nanotubes	Not Available	Not Available	None.
Insoluble Molybdenum Compounds, as Mo	TWA = 10 mg/m ³ (8-hr day, inhalable fraction), TWA = 3 mg/m ³ (8-hr day, respirable fraction)	TWA = 10 mg/m ³ (8-hr day, total dust)	None.
Cobalt Compounds, as Co	TWA = 0.02 mg/m ³ (8-hr day)	TWA = 0.05 mg/m ³ (8-hr day)	15 ug/L urine *** 1 ug/L blood ***

- * = Limit established by SWeNT for internal use.
- ** = Workplace Environmental Exposure Level (AIHA).
- *** = Biological Exposure Index (ACGIH).

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.

OTHER EXPOSURE LIMITS FOR POTENTIAL DECOMPOSITION PRODUCTS: None.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Black liquid		
PHYSICAL STATE:	Liquid.		
ODOR:	Amine smell		
SPECIFIC GRAVITY (water = 1.0):	0.75		
SOLUBILITY IN WATER (weight %):	Dispersion.		
pH:	4-10		
BOILING POINT:	63 deg C		
MELTING POINT:	Not applicable.		
VAPOR PRESSURE:	Not determined.		
VAPOR DENSITY (air = 1.0):	Not determined.		
EVAPORATION RATE:	Not determined.	COMPARED TO:	Not applicable.
% VOLATILES:	>98%		
FLASH POINT:	Not determined.		

(Flash point method and additional flammability data are found in Section 5.)

SECTION 10 STABILITY AND REACTIVITY**NORMALLY STABLE? (CONDITIONS TO AVOID)**

Stable under recommended storage conditions.

INCOMPATIBILITIES:

Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS:

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

HAZARDOUS REACTIONS:

Vapours may form explosive mixture with air.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE (ACUTE) EFFECTS:

LD50 Oral – rat – 152 mg/kg
LD50 Dermal - rabbit – 2,500 mg/kg

Signs and Symptoms of Exposure:

Material (2-butylamine) is extremely destructive to mucus membrane tissue and upper respiratory tract, eyes and skin. To the best of our knowledge, the physical and toxicological properties have not been thoroughly investigated.

DELAYED (SUBCHRONIC AND CHRONIC) EFFECTS:

Carbon nano materials - No data available.

OTHER DATA:

See section 3 and RTECS: EO3325000

SECTION 12 ENVIRONMENTAL INFORMATION

No data available.

SECTION 13 DISPOSAL CONSIDERATIONS

OTHER DISPOSAL CONSIDERATIONS:

Disposal of carbon nano materials is not allowed by federal, state and local government regulations. It must be destroyed by a suitable method including, but not limited to, incineration, but exert extra care in igniting as the mixture is highly flammable.

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: UN 2924 (flammable liquid); class: 3 (3,8); packaging group: 2
Proper shipping name: **flammable liquids, corrosive, n.o.s.**

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 mixture contains material manufactured under the terms of the TSCA LOREX exemption at 40CFR 732.50(c)(2), and under the requirements of 40 CFR 723.5(i). Further, according to CFR 723.50 (k)(2) this material cannot be further distributed until it has been reacted, incorporated into an article or otherwise rendered into a physical form or state.

OTHER TSCA ISSUES: Solvents are TSCA listed.
None.

SARA TITLE III/CERCLA

"Reportable Quantities" (RQs) and/or "Threshold Planning Quantities" (TPQs) exist for the following ingredients.

INGREDIENT NAME	SARA/CERCLA RQ (lb)	SARA EHS TPQ (lb)
No ingredients listed in this section.		

Spills resulting in the loss of any ingredient at or above its RQ requires immediate notification to the National Response Center (1-800-424-8802) and to your Local Emergency Planning Committee.

SECTION 311/312 HAZARD CLASS: Fire Hazard, Acute Health Hazard.

The following ingredients are SARA 313 "Toxic Chemicals". CAS numbers and weight percents are found in Section 2.

INGREDIENT NAME	COMMENT
Cobalt Compounds	Elemental metal content < 15 ppm

STATE RIGHT-TO-KNOW

In addition to the ingredients found in Section 2, the following are listed for state right-to-know purposes.

INGREDIENT NAME	WEIGHT %	COMMENT
2-aminobutane	60-90%	MA, NJ, PA
2-propanol	40-10%	CA, NJ, PA, MN, MA

California Prop. 65 components

This mixture does not contain any chemical s know to the State of California to cause cancer, birth or any other reproductive defects.

ADDITIONAL REGULATORY INFORMATION

WHMIS CLASSIFICATION (CANADA):

Not determined.

FOREIGN INVENTORY STATUS:

All components of this product 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: Oct 2009
PREVIOUS ISSUE DATE: None

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

N/A

OTHER INFORMATION:

None.

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