



jb martin

MATERIAL SAFETY DATA SHEET

SECTION I: PRODUCT IDENTIFICATION

Product Name:	Carbon/Kevlar® (Aramid) hybrid fabric, TN-05-P	
Weaver:	<i>jb martin ltée</i> 445 St-Jacques Québec, Canada J3B 2M1 Tel.: (450) 346-6853	
Raw material:	Grafil, Inc. 5900, 88th Street Sacramento, CA 95828 USA	DuPont Canada, Inc. P.O. Box 2200 Streetsville Mississauga, Ontario L5M 2H3
Emergency Telephone:	(916) 386-1733	(613) 348-3616 (24 hours)
General Telephone:	(916) 386-1733	(800) 387-2122
Facsimile Number:	(916) 383-7668	

SECTION II: COMPOSITION/INFORMATION ON INGREDIENTS

<u>Components</u>		
<u>Material</u>	<u>CAS RN</u>	<u>%</u>
Carbon Fiber	7440-44-0	≥ 99%
Epoxy Resin	not applicable	0,4%
Poly (terephthaloylchloride/p-phenylenediamine) (para-aramid polymer)	26125-61-1	>89 WT%
Water, absorbed	7732-18-5	0-7 WT%
Pulp wet-lap		35-50 WT%
Sodium sulfate in KEVLAR® pulp:	7757-82-6	<0,1 WT%
In other forms:		<2 WT%
Finish:	NONE	<5 WT%

SECTION III: HAZARDS IDENTIFICATION

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Emergency Overview

Kevlar® aramid fiber is a golden yarn, staple, flock, pulp, or fabric. As shipped these products pose no immediate hazard. Processing and handling can produce airborne respirable fibrils (subfibers). Animal studies indicate that prolonged overexposure to such fibrils has the potential for lasting lung damage. Use ventilation or a respirator to minimize fibril inhalation.

During a fire, these Kevlar® products are unlikely to release many respirable fibers, but may release toxic and irritating gases, much like wool. Kevlar® will burn only with added heat, but pulp and dust may smolder. Kevlar® pulp and dust do not present an explosion hazard.

Kevlar® fibers are nonbiodegradable and nontoxic to aquatic life; they pose no unusual environmental hazard in a spill or fire.

Potential Health Effects

Eye: Fiber fly and dust may cause slight mechanical irritation.

Skin: Continual rubbing of fibers and fiber pieces on the skin (as when trapped under cuffs or collar, or when constantly handling fabrics) may cause irritation. Based on animal tests, the fibers do not cause sensitization (allergic reaction).

Ingestion: Based on animal studies, Kevlar® is nontoxic when eaten.

Inhalation: Kevlar® fiber is too big to inhale into the lungs, but fiber dust and fly from processing may be breathed into the nose and throat. Working unprotected in dusty conditions may cause upper respiratory irritation and cold-like symptoms.

Chronic effects: Processing Kevlar® or machining materials containing Kevlar®, may create fiber dust in the air small enough to be breathed into the lungs. Based on animal tests, breathing this dust at very high concentration repeatedly over a long time may cause lung injury (fibrosis).

Cancer: Kevlar® fibrous dust did not cause cancer in long term animal inhalation studies. [See the Toxicology section and references contained in the “**section XVI: Other information**” of this MSDS.

Carcinogenicity information: None of the components present in this material at concentrations equal to or greater than 0,1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

CARBON

Emergency Overview

-NONE-

This product is not expected to present an immediate concern for emergency response personnel

Potential Health Effects

Skin: This product may cause slight irritation of the skin. Mechanical irritation may arise from the carbon fiber abrading or becoming imbedded into the skin. Chemical irritation may occur from exposure to sizing present on the fibers.

Eye: Fragments of this product may cause mechanical irritation of the eye. Chemical irritation may occur from exposure to sizing present on the fibers.

Inhalation: Inhalation exposure to respirable fibers of this products is not expected to occur under normal industrial use. However, under very limited circumstances, exposure to respirable fibers of this product can occur and result in irritation of the respiratory tract.

Ingestion: No hazard is expected during normal industrial use. Ingestion is not a likely route of exposure for this product.

Chronic effects/Carcinogenicity: None of the ingredients in this product are listed as carcinogens or potential carcinogens by OSHA, NTP, or IARC. Under very limited circumstances, exposure to respirable fibers of this product can occur and result in irritation to respiratory tract; prolonged exposure may cause more adverse effects.

Signs and symptoms of exposure: Slight irritation of the affected area.

SECTION IV: FIRST AID MEASURES

CARBON

Eyes: If fibers get into the eyes, flush eyes with water for 15 minutes. Get medical attention.

Skin: Wash fibers off running water with soap. If fibers are imbedded in the skin, remove fibers with tweezers. Get medical attention if irritation develops or persists.

Inhalation: If there is inhalation exposure to the fibers of this product, remove source of exposure and move victim to fresh air. Get medical attention if irritation develops.

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Eye contact: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician, if irritation persists or develops later.

Inhalation: If large amounts of fumes, dust or fibers are inhaled, remove to fresh air. If breathing is difficult, give oxygen and call a physician. If persistent cough or other symptoms develop, get medical attention.

Skin contact: If fibers irritate the skin, wash with soap and water. Wash contaminated clothing before reuse. Use hand cream to soothe and moisten irritated skin. Get medical attention if irritation persists after contact stop.

Ingestion: Not a probable route. However, in case of gastro-intestinal distress following accidental ingestion, call a physician.

SECTION V: FIRE FIGHTING MEASURES

CARBON

Flammable properties: Not expected to burn. However, under high heat (>750°F), this product may react with oxygen to give off carbon oxides and other decomposition products.

Flash point: Not applicable.

Flammable limits (UFL/LFL): Not applicable

Extinguishing media: This material is not expected to burn in a fire. If this product is present in a fire, fight fire based on the presence of materials that are flammable.

Fire fighting instructions: As in any fire, wear a self-contained breathing apparatus with pressure demand (MSHA/NIOSH approved or equivalent) and full protective gear.

Other information: Do not incinerate. This product is not expected to burn, however, incineration of carbon fibers can generate airborne fibers that can cause electrical malfunction.

See Section XIII – Disposal considerations.

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Flammable properties:

Flash point:	Not applicable.
Autoignition:	Not applicable
Explosive limits:	Not applicable

Kevlar® fiber is inherently flame resistant, but can be ignited (limiting oxygen index = 29). Burning normally stops when the ignition source is removed. Pulp and dust accumulations may continue to smolder if once ignited. Kevlar® fiber dust does not present an explosion hazard.

Fire and explosion hazards: Burning Kevlar® produces hazardous gases similar to those from wool. These are mostly carbon dioxide, nitrogen oxides and small amounts of hydrogen cyanide, ammonia, aldehydes, aliphatic hydrocarbons and other toxic gases, depending on conditions of burning.

Extinguishing media: Water, foam, dry chemical, CO₂.

Fire fighting instructions: Wear self-contained breathing apparatus. Keep personnel removed and upwind of fire. Wear full protective equipment (full Bunker gear).

SECTION VI: ACCIDENTAL RELEASE MEASURES

Review “**section V: fire fighting measures**” and “**section VII: handling**” before proceeding with clean-up.

Use appropriate personal protective equipment during clean-up.

SECTION VII: HANDLING AND STORAGE

Store carbon in a cool dry place. Wash hands with soap and water after handling the product.

Handling (personnel): Do not touch moving threadlines of Kevlar®. Entanglement with this high strength fiber can severely cut or even sever fingers.

Storage: Kevlar® is degraded by ultraviolet light. Do not store in direct sunlight. Fluorescent lighting will cause discoloration, but will not affect fiber mechanical properties.

SECTION VIII: EXPOSURE CONTROLS/PERSONAL PROTECTION

CARBON

Engineering control: No special ventilation requirements. Good general ventilation should exist as part of any sound industrial hygiene program.

Exposure guidelines: Neither OSHA nor ACGIH has established any air contaminant limits specific to carbon fibers. OSHA has established standard for particulates not otherwise regulated (nuisance dust) set at 5 mg/m³ (respirable fraction) and 15 mg/m³ (total dust). ACGIH has established an exposure value of 10 mg/m³ (total dust) for particulates not otherwise classified.

Respiratory protection: Normal use and processing of this product are not expected to generate dust. Respirable fibers of this product can, under limited circumstances, be generated in which case NIOSH-approved HEPA respiratory protection should be used to prevent exposure.

Eye protection: Eye protection should be worn when handling or processing carbon fibers in any form.

Protective gloves: Latex gloves should be worn when handling this product. Wash hands with soap and water after handling the product.

Skin protection: No special precautions are needed.

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Generally applicable control measures and precaution: Use only with adequate ventilation. Avoid dust generation. Do not consume food, drink or tobacco in the areas where they may become contaminated with this.

Engineering controls: If fumes fiber fly or dusts are generated, use engineering controls (where technically feasible) whenever necessary to control exposures below applicable limits. Isolation, enclosures, exhausts and ventilation, wetting and dust collection systems may be used.

If ventilation and exhaust air is recirculated, it should be filtered and conditioned to eliminate respirable fibers, dust and fumes. While HEPA filters are effective for dust removal from local exhausts, they have high pressure drops and require frequent maintenance. Larger air flows can be effectively cleaned of nonrespirable fibers and particles by screens and coarse filter media. However, respirable particles can be removed only by secondary filtration equipment designed for fine particles (less than 10 micrometers aerodynamic diameter) or water curtains. Where respirable fibrils may be generated, recirculated air should be periodically measured to determine if they are being adequately removed. Air monitoring should be done using the standard asbestos test method, NIOSH 7400 (B).

Fumes and smoke from laser cutting or machining of fabrics and composites of Kevlar® should be well exhausted or removed by ventilation.

Water jet cutting of fabric of composite of Kevlar® produces respirable size fibrils in the cutting waste. If dried, this waste can become a source of airborne respirable fibers. Rinse or wipe waste from floors, work surfaces and parts before it dries.

Respiration protection: Respirator use must be in accordance with OSHA Standard CFR 1910.134 (the “Respirator Standard”).

Where airborne dust and fibril concentrations are expected to exceed applicable exposure limits, or where there is potential for irritation of the nasal passage by the mechanical action of the fibers, NIOSH/MSHA-approved respirators should be used.

An air purifying respirator with a dust/mist/fume cartridge or canister may be used under circumstances meeting the Respirator Standard.

Disposable dust masks equivalent to 3M model 8710 or equivalent may also be used.

Eye protection: Wear safety glasses or coverall goggles when cutting or mechanically working this product, or where airborne dust and fly is present.

Skin protection: When repeated forceful contact with Kevlar® fiber structures is anticipated, wear protective gloves and sleeves to minimize skin abrasion and drying.

If repeated handling of Kevlar® leads to dry skin, use non-greasy moisturizing skin cream. (Barrier creams are not recommended, as they may actually cause fiber dust to stick to the skin.)

Applicable exposure limits:

Poly(terephthaloylchloride/p-phenylenediamine) (para-aramid polymer)

PEL (OSHA): None Established

TLV (ACGIH): None Established

AEL* (DuPont): 2 fibers/cc, 8 Hr. TWA, respirable fibers

Fibrils < 3 u in diameter, > 5 u in length, and with an aspect ratio > 3:1.
5mg/m³, 8 Hr. TWA, total dust for non-respirable fibers or non-fibrous particulate

* AEL is a DuPont’s Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

SECTION IX: PHYSICAL AND CHEMICAL PROPERTIES

CARBON

Appearance: Black continuous, chopped, or milled fibers
Physical state: Solid
Odor: None
Vapor pressure: Not applicable
Melting point: Not applicable
Specific gravity: 1,75 – 1,85
Solubility in water: Insoluble

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Melting point: Does not melt
Solubility in water: Insoluble in water
Odor: Odorless
Specific Gravity: 1,45 g/cc
Color: Golden
Form: Solid; yarn, fabric, (felt, paper, pulp, floc, staple)
% Volatiles: < 9%, water and finish (wet-lap pulp has <50% water)

SECTION X: STABILITY AND REACTIVITY INFORMATION

CARBON

Stability: Stable
Conditions to avoid: None
Incompatibility with other materials: Do not expose to strong oxidizing agents (e.g., fluorine). Carbon fiber can react violently with such oxidizing agents.
Hazardous decomposition products: Not expected under normal conditions of use and processing. At temperature above 250°F, thermal decomposition of the sizing may begin to occur resulting in the release of small amounts of NO_x, CO, organic compounds, and other hazardous substances.
Hazardous polymerization: Will not occur

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Chemical stability: Stable at normal temperatures and storage conditions
Incompatibility with other materials: None reasonably foreseeable
Decomposition: Fiber decomposition temperature > 400°C. At lower temperatures finish may boil off as a fume which should be vented.
Polymerization: Polymerization will not occur

SECTION XI: TOXICOLOGICAL INFORMATION

CARBON

No toxicological information exists on this product. Limited toxicological information does, however, exist on the components of this product. Please contact the company (Grafil) for more information concerning these individual components.

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Animal data

Eye effects: Kevlar® is untested for eye irritancy. As with other particles, mechanical action of fibers in the eye may cause slight irritation.

Skin effects: Kevlar® fiber is not a skin irritant, or a skin sensitizer in animals. None of three tests using guinea pigs produced sensitization.

Skin sensitization has not been observed in human patch test or in industrial experience. (Kevlar® fiber has been used in direct contact with the skin in industrial gloves and protective apparel for many years.)

The mechanical action of the fibers may cause slight skin irritation at clothing binding points. Repeated harsh rubbing of the skin with fibrous dust or supported Kevlar® fiber structures (e.g., sized, coated or impregnated fabrics, paper edges, etc.) may cause abrasion, with resulting irritation and rash. Symptoms disappear following cessation of skin contact.

Acute oral effects: Kevlar® has very low toxicity by ingestion. Oral ALD < 7500 mg/kg in rats.

Acute inhalation effects: Industrial experience shows that inhalation of Kevlar® fibrous dust and fly may cause mechanical irritation of the mucous membrane of the nose and throat; these symptoms disappear upon cessation of exposure.

Subchronic inhalation effects: In a two weeks inhalation study with rats (1983), respirable Kevlar® fibrils (subfibers) at concentration of 1000-2000 fibrils per cubic centimeter (f/cc) caused mild nonprogressive fibrosis (lung scarring that shrinks with cessation of exposure) and nonspecific effects such as weight loss and irritation. There were no permanent effects at concentration of 280 f/cc or less.

Chronic inhalation effects: A two years inhalation study with Kevlar® pulp (refined to increase its respirable fibril content) showed fibrosis at concentrations of 25, 100, and 400 f/cc. To further characterize these lesions (previously identified as cystic keratinizing squamous cell carcinomas) a panel of 12 pathologists from North America and Europe reviewed them and diagnosed them as “proliferative keratin cysts”. They agreed that the lesions are not malignant neoplasms and are most likely not neoplastic. This unique lesion is not found in humans and may be indicative of a nonspecific biological response to the respirable material, rather than an indication of the toxicity of Kevlar®. No fibrosis was seen in animals exposed to 2,5 f/cc for two years. At no concentrations were fibers found to have migrated beyond the lungs and associated lymph system. Four experiments at fibril concentrations of 2,5 to 400 f/cc have shown that Kevlar® fibrils in the lungs of rats are shortened with time, probably by enzymatic clipping of the polymer chain. While not all fibrils disappear, long fibers are cut to an

average of less than 5 micrometers and gradually removed. This effect is faster, the lower is the exposure. Abdominal cavity tumors have been observed in rats administered Kevlar® by intra-cavity injection, but at levels not considered significant.

Industrial monitoring of airborne fibril concentrations indicate it would be unlikely that human exposures would approach levels that caused permanent health effects in animal studies. However, based on these animal studies, long term exposures to high doses of respirable fibers could lead to pulmonary inflammation and subsequent development of chronic lung disease.

No animal tests have been run to define mutagenic, developmental or reproductive hazards.

SECTION XII: ECOLOGICAL INFORMATION

CARBON

No ecological information exists on this product.

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Kevlar® aramid fiber is essentially nonbiodegradable in the environment, and does not leach material toxic to flora or fauna.

Finishes and additives used with Kevlar® are routinely tested for their potential effects on manufacturing wastewater treatment systems. Biocompatibility and aquatic toxicity tests give the following results:

- No finishes appear to be inhibitory or toxic to microbes commonly found in biological treatment systems.
- Biodegradation and normal anti-foam treatments should control foaming.
- Discharge of scoured finishes should not result in increased effluent toxicities.
- Finishes are completely or substantially biodegradable.

Since concentrations and treatment conditions vary, the above should be considered indicative only.

SECTION XIII: DISPOSAL INFORMATION

CARBON

The waste material of this product is not expected to be hazardous. Landfill waste material. Do not incinerate carbon fibers since airborne fibers may cause electrical malfunctions. Any disposal practices must be in compliance with federal state, and local laws and regulations. Contact local or state environmental agencies for specific requirements.

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Kevlar® aramid fiber is not a hazardous waste as defined by regulations implementing the Resource Conservation and Recovery Act (RCRA). In general, Kevlar® waste materials may be treated, stored,

transported and disposed of in accordance with the State and Local regulations governing the disposal of other common or non-RCA regulated waste material.

Waste such as waterjet cutter sludge or dust from air filters may be enriched in respirable fibers. Bag securely, label as containing respirable fibers, and dispose of it as nonhazardous industrial waste.

Since the fiber is essentially nonbiodegradable it should not be flushed to surface waters or sanitary sewer systems.

SECTION XIV: TRANSPORTATION INFORMATION

Shipping information:

DOT: Proper Shipping Name: None. Not regulated

CANADA: TDG CLASS: Not regulated

ICAO: International Civil Aviation Organization classification not required

IMDG: International Maritime Dangerous Goods classification not required

Shipping information – Canada

This material is not regulated

SECTION XV: REGULATORY INFORMATION

CARBON

Regulatory status on this product: All product ingredients are either on the Toxic Substances Control Act (TSCA) Chemical Substances Inventory or are not required to be. This product and its impurities may trigger other specific reporting, record keeping, and testing requirements under EPCRA/SARA III, CAA, RCRA, SDWA, CERCLA, and CWA.

EPCRA section 313 information: This product contains no chemicals known to the State of California to cause cancer or reproductive toxicity.

California Prop. 65 status: This product contains no chemicals known to the State of California to cause cancer or reproductive toxicity.

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U.S. Federal Regulations

OSHA: This msds is provides to comply with provisions of the Hazard Communication Standard (29 CFR 1910.1200).

EPA: Kevlar® products are listed on the TSCA inventory.

CERCLA: Kevlar® is not regulated as hazardous waste under CERCLA.

SARA TITLE III, section 313: Not reportable.

CLEAN AIR AMENDMENTS OF 1990: Kevlar® aramid fiber products and their packaging do not contain, nor are they manufactured with, any of the ozone-depleting substances listed in either Class I (chlorofluorocarbons) or Class II (hydrochlorofluorocarbons) of the Clean Air Act Amendments of 1990.

FDA: Some, but not all, Kevlar® aramid fiber products are approved for use as articles or components of articles intended for repeated contact with food.

Sate Regulations (U.S.)

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This product contains none of the substances known to the State of California to cause cancer or reproductive toxicity.

Pennsylvania and New Jersey Right-to-Know Laws: This product is not subject to the provisions of the Pennsylvania or New Jersey Right-to-Know Laws.

Canadian Regulations

This is not a WHMIS controlled product.

CEPA status: DSL: REPORTED/INCLUDED.

Regulatory information disclaimer: The information given here in section XV – Regulatory information is intended to be as complete as possible. It is the user’s responsibility, however, to determine and comply with all applicable laws and regulations under federal, state, and local requirements in the use of this product.

SECTION XVI: OTHER INFORMATION

NFPA, NPCA-HMIS

NFPA rating:

Health: 0

Flammability: 1

Reactivity: 0

NPCA-HMIS rating:

Health: 0 (Chronic health effects)

Flammability: 1

Reactivity: 0

Additional information

CAUTION: DO NOT USE IN MEDICAL APPLICATIONS INVOLVING PERMANENT OR TEMPORARY IMPLANTATION IN THE HUMAN BODY OR CONTACT WITH BODY FLUIDS.

References:

- Reindhardt, C.F., M.D., PROCEEDINGS OF NATIONAL WORKSHOP ON SUBSTITUTES FOR ASBESTOS, (1980), EPA-560/3-80-001, 443-447.
- Lee, K.P., et al., TOXICOLOGY AND APPLIED PHARMACOLOGY, 71 (1983), 243-253.
- Lee, K.P., et al., FUNDAMENTAL AND APPLIED TOXICOLOGY, 11 (1988), 1-20.
- Kelly, D.P., Merriman, E.A., Kennedy, G.L., Jr., and Lee, K.P., FUNDAMENTAL AND APPLIED TOXICOLOGY, 21, (1993), 345-354.
- Malley, L.A., Slone, T.W., Jr., Makovec, O.T., Elliott, G.S., and Kennedy, G.L., Jr., FUNDAMENTAL AND APPLIED TOXICOLOGY, 28, (1995), 80-93.
- Warheit, D.B., Kellar, K.A. and Hartsky, M.A., TOXICOLOGY AND APPLIED PHARMACOLOGY, 116, (1992), 225-239.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

The technical department