

Material Safety Data Sheet

Teijin Aramid bv

Twaron® para-Aramid Yarn

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Twaron® para-Aramid Yarn
Chemical Name: Poly-paraphenyleneterephthalamide
Synonym: p-Aramid
C.A.S. Registry No.: 26125-61-1
Chemical Formula: Polymer (C₈H₄Cl₂O₂.C₆H₈N₂)_x
Product Uses: Strength member in cables Ballistic protection material
 Elastomer reinforcement Composites, protective apparel

Manufacturer / Supplier

TEIJIN ARAMID BV
 Velperweg 76
 P.O. Box 5153
 6802 ED Arnhem, The Netherlands
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 E-mail: SDSinfo@teijinaramid.com

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2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

No health risks have so far become available when this fiber product has been handled/processed properly and used for its intended application.

Wear appropriate personal protective equipment as needed (see section 8 for additional information).

Appearance and odor: odorless yellow filament yarn, spinning fiber, staple fiber, cut fiber

POTENTIAL HEALTH EFFECTS [See section 11 for additional information]

Primary Route(s) of Exposure: Eye contact, skin contact and inhalation.

Acute Exposure: The fiber product (polymer) is non-toxic. Dust may be irritating to the respiratory tract and cause symptoms of bronchitis. This product has a low order of acute toxicity and ingestion is not expected to cause any harm.

Carcinogenicity: IARC, NTP, ACGIH or OSHA does not classify this material as a carcinogen or suspect carcinogen. IARC rated p-Aramid fibrils as “non-classifiable as to its carcinogenicity for animals or humans” (Class III).

Medical conditions aggravated: Inhalation of dust could aggravate existing respiratory condition.

POTENTIAL ENVIRONMENTAL EFFECTS [See Section 12 for additional information]

This product is not considered to be harmful to aquatic life.

3. COMPOSITION / INFORMATION ON INGREDIENTS

INGREDIENTS	% (w/w)	CAS Number
Poly-(para-phenylene terephthalamide)	50 - 98	26125-61-1

Additives:

- Fiber finish ... < 1.2%
- Sodium sulfate ... < 3%
- Absorbed water ... < 8%
- Pigments ... < 8% [only Twaron type(s) D1026, D2226]
- Water-blocking agents ... < 5% [only Twaron type(s) 1052, 1002, D3052]
- PTFE ... < 40% [only Twaron type(s) 1030, 1031]
- Silicone oil ... < 22% [only Twaron type(s) 1030]

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3. COMPOSITION / INFORMATION ON INGREDIENTS (CONTINUED)

- Medical white oil ... < 10% [only Twaron type(s) 1031]
- Modified polyester resin ... < 7% [only Twaron type(s) 1484, 1486 & 1488]
- Epoxy composition ... < 0.4% [only Twaron type(s) 1014, 1015 & 1016]
- Polyether-polyurethane ... < 7% [only Twaron type(s) 1684, 1686 & 1688]
- Aliphatic polyester urethane ... < 6% [only Twaron type(s) 2800]
- Fiber finish of sodium and potassium salts of carboxylic acid ... < 7% [only Twaron type(s) 2255]
- Fatty alcohol ethoxylate ... < 0.4% [only Twaron type(s) D2204, D2304]

Other information - Fiber finish.

The fiber product itself is not toxic. It may, however, contain up to 1.2% of a fiber finish. If the product is intended for special applications, e.g. in the food industry, please consult the manufacturer prior to application. So far, no impairment of health has become known in cases where the product has been used for its intended application. The applied fiber finish may evaporate or decompose in cases where the product is heat-treated at temperatures of 266-374°F (130-190°C). If water is used for further treatment, the waste water generated by the process must be treated in a water purification plant in compliance with local regulations.

Residual solvents: none.

Fibers and yarns are generally provided with finishes to facilitate processing. If necessary, these finishes, and also coning oils or sizing agents, can generally be removed in an aqueous medium.

4. FIRST AID MEASURES

Inhalation: Remove victim to fresh air if person has been exposed to excessive quantities of fiber dust or fly. If breathing becomes difficult, oxygen may be given, preferably under physician's advice. Get medical attention if coughing or other symptoms develop.

Eye Contact: Flush eyes with large quantities of running water for a minimum of 15 minutes. If easy to do, remove contact lenses, if worn. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids with water. Get medical attention if eye irritation occurs.

Skin Contact: Remove contaminated clothing, shoes and equipment. Flush skin with plenty of water for at least 15 minutes. Wash contaminated clothing and shoes before reuse. Get medical attention if irritation occurs.

Ingestion: Do not induce vomiting, unless instructed by a physician. If victim is conscious, rinse mouth and give water to drink. If vomiting occurs, keep head below the hips to reduce risk of aspiration. Give fluids again. Never give anything by mouth to an unconscious person. Get medical attention as warranted.

Note to Physician: Attending physician should treat exposed patients symptomatically.

5. FIRE FIGHTING MEASURES

Conditions of Flammability:	not flammable or combustible
Flash Point (Method):	not determined
Upper Flammable Limit (% by volume):	not determined
Lower Flammable Limit (% by volume):	not determined
Auto-Ignition Temperature:	not determined

Extinguishing Media: This product is not flammable or combustible. If involved in a fire, use extinguishing agents suitable for surrounding materials, such as water fog or spray, dry chemical, foam, carbon dioxide or other Class B agents. Avoid solid water stream. Do not use water if fire was caused by an electrical short circuit.

Fire Fighting Procedures: As in any fire, prevent human exposure to fire, smoke, fumes or products of combustion. Evacuate all non-essential personnel from the fire area. Fire fighters should wear full-face, self-contained breathing apparatus approved by MSHA/NIOSH and impervious protective clothing.

Fire & Explosion Hazards: This product is not defined as flammable or combustible and should not be a fire hazard under normal use conditions. Organic dust can be explosive when ideal conditions of concentration, humidity, temperature and source are met.

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5. FIRE FIGHTING MEASURES (CONTINUED)

Hazardous Combustion Products: Do not inhale explosion or combustion vapors. Thermal decomposition may release toxic and/or hazardous products such as carbon oxides, organic compounds of low molecular weight and hydrogen cyanide in low concentration. Decomposition products are roughly comparable to those of wool.

NFPA Hazard Rating – Health: 1 **Fire:** 1 **Instability:** 0 **Other:** None
 [0 - Minimal 1 - Slight 2 - Moderate 3 - High 4 - Extreme]

6. ACCIDENTAL RELEASE MEASURES

Spill or Leak: Safely stop source of spill. Restrict non-essential personnel from area. All personnel involved in spill cleanup should avoid skin and eye contact by wearing appropriate personal protective equipment (see section 8). Do not breathe dust.

Cleanup: Sweep or vacuum spilled solid material, being careful not to create dust. Return sweepings to stock or, if contaminated, place into a chemical waste container for disposal according to local, state or federal regulations. To minimize dust, vacuum cleaning is preferred.

7. HANDLING AND STORAGE

Handling: Avoid prolonged and/or repeated skin and eye contact. Do not breathe dust.

Storage: Store this material in a cool, dry and well-ventilated area. Observe good housekeeping practices. Contain and prevent dust collection. If airborne contaminants are generated when the material is heated or handled, sufficient ventilation in volume and air flow should be provided. (See section 8).

Maximum Storage Temperature: Store in a cool and dry place at ambient temperature (below 25°C / 77°F).

Other Precautions: All cardboard containers, storage cartons, bobbins, bales and bags must be stored in compliance with relevant regulations and in accordance with good handling and storage practice.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limits: *p*-Aramid fibers as such are not subject to any exposure regulation. *p*-Aramid respirable fiber-shaped particulates (RFP) may be released from pulp, cut-fiber and staple fiber or may be formed during abrasive processing of Twaron and it is recommended to keep these levels below 1 RFP (Respirable Fiber Particulates) per cm³ of air.

Engineering Controls - Ventilation: Use extraction and ventilation equipment to reduce the occurrence of fiber fly, fiber dust and decomposition products of the finish.

Personal Protective Equipment (PPE): Handle in accordance with good industrial hygiene and safety practices. These practices include avoiding unnecessary exposure and removal of the material from the eyes, skin, and clothing.

- **Respiratory Protection:** MSHA/NIOSH approved respiratory protection should be worn when maximum concentration of 1 RFP (respirable fiber-shaped particulate) per cm³ of air is exceeded.
- **Skin Protection:** Skin contact with the product should be minimized or prevented through the use of suitable protective clothing, gloves and footwear selected according to use condition exposure potential.
- **Eye Protection:** Safety glasses are generally not required when manually handling yarn. However, wear safety glasses with side shields in the vicinity of rapidly rotating yarn processing equipment.

Other Protection – General Hygiene Considerations: Wear aprons, boots, and other suitable body protection appropriate to the existing work environment. Yarns that are processed at high speeds can cause abrasions and cuts. Make eyewash stations, washing facilities, safety showers available in areas of use and handling. All food and smoking materials should be kept in a separate area away from the storage/use location. Eating, drinking and smoking should be prohibited in areas where there is a potential for significant exposure to this material. Wash hands before eating, drinking, smoking or using washroom. Adhere to sanitation requirements of 29CFR1910.141.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State / Appearance / Odor:	odorless yellow filament yarn, spinning fiber, staple fiber, cut fiber
Boiling Point:	not applicable
Bulk Density:	not applicable
Cloud Point:	not determined
Evaporation Rate (Butyl Acetate=1):	not applicable
Melting Point:	does not melt
Odor Threshold:	not determined
pH:	not determined
Partition Coefficient (n-octanol/water):	not determined
Pour Point:	not determined
Solubility in water:	negligible
Solubility in other solvents:	not determined
Specific Gravity / Density:	1440 kg/m ³
Vapor Density (Air = 1):	not applicable
Vapor Pressure:	not applicable
Viscosity:	not applicable
Conditions of Flammability:	not flammable or combustible
Flash Point (Method):	not applicable
Upper Flammable Limit (% by volume):	not applicable
Lower Flammable Limit (% by volume):	not applicable
Auto-Ignition Temperature:	not applicable

< : less than > : greater than ~ : approximately

10. STABILITY AND REACTIVITY

Stability: This product is stable at ambient temperatures and atmospheric pressures under recommended storage and handling conditions (see section 7). It is not self-reactive and is not sensitive to physical impact.

Conditions to avoid: Temperatures over 932°F (500°C) will cause decomposition of the products and molecular disintegration. Strong bases and acids will cause chemical decomposition (hydrolysis) of the molecules if allowed to react for a relatively long duration.

Incompatibilities: Aromatic polyamides react with strong oxidizing agents. If allowed to act on the fibers for a relatively long time, UV light will cause a darkening of their inherent yellow color and will also adversely affect their strength.

Polymerization: Hazardous polymerization is not expected to occur under normal temperatures and pressures.

Hazardous Decomposition Products: Thermal decomposition may release toxic and/or hazardous products such as carbon oxides, organic compounds of low molecular weight and hydrogen cyanide in low concentration.

11. TOXICOLOGICAL INFORMATION

The fiber product (polymer) is non-toxic. Usually the fibers are treated with about 1% finish. All additives are non-toxic according to the safety data sheets of their manufacturers.

INHALATION

- **Acute exposure:** The acute LC₅₀ for this product is not available.
- **Repeated dose exposure:** The following information does not relate to the intact fibers but only to **respirable, fiber-shaped particulates (RFP)**, which may be found in small numbers in the workplace atmosphere due to abrasive processing. RFP are fragments with diameters of less than 3 µm, lengths up to 100 µm and a length/diameter ratio of at least 3:1.
 - **Subacute and subchronic exposure:** Short term and subchronic (3 months) inhalation studies in rats and hamsters with an extended follow-up of up to nine months have demonstrated that p-Aramid RFP are not biopersistent. Long p-Aramid RFP are quickly transversely broken into smaller fragments and then removed from the lung. However, extremely high amounts of inhaled p-Aramid RFP may inhibit the clearance mechanism. 25 RFP/ml of air has been established as the "no observed adverse effect level" in subchronic study. Inhalation of high concentrations of RFP causes pulmonary inflammation in rats and hamsters and overload phenomena in rats.

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11. TOXICOLOGICAL INFORMATION (CONTINUED)

- **Chronic exposure:** Lifelong exposure to concentrations of 100 and 400 RFP/ml caused pulmonary fibrosis in rats. The fibrosis was largely reversible after cessation of exposure. No malignant tumors resulted from the lifelong inhalation tests in rats. Instead, proliferative cystic tissue changes were observed in rats after exposure to particulates. They occur mainly in (female) rats and have never been observed in human beings. These cysts were subject of scientific debate for an extended period of time, but current consensus holds that they are not malignant and that their occurrence in animals has no relevance to humans.
- **Other routes of exposure:** Intraperitoneal injections of excessive amounts of p-Aramid RFP caused only a non significant increase in the observed number of mesotheliomas. The validity of the intraperitoneal test for the prediction of carcinogenicity is questionable.

SKIN

Acute contact: Dermal toxicity for this product is not available. Slight skin irritation has been observed in isolated cases.

Chronic contact: No known effects for this product.

EYES: While this product has not been tested, it is expected that it would be minimally irritating to the eyes based on tests with similar products.

INGESTION

Acute exposure: The oral LD₅₀ is not available for this product.

Chronic exposure: No known effects.

Sensitization: Not data available for this product.

Carcinogenicity: IARC, NTP, ACGIH or OSHA does not classify this material as a carcinogen or suspect carcinogen. IARC rated p-Aramid fibrils as "non-classifiable as to its carcinogenicity for animals or humans" (Class III).

Mutagenicity / Teratogenicity / Embryotoxicity: No data available.

Target Organs: Skin, eyes and respiratory tract.

Other Toxicological Effects: In the event that the product is to be used in special areas of application, e.g. food industry or the medical/surgical sector, please consult manufacturer beforehand.

12. ECOLOGICAL INFORMATION

Ecotoxicity: No experimental ecological data are available for this product. The fiber product (polymer) is ecologically safe. In cases where the product is heat-treated at temperatures above 120°C (248°F), the applied fiber finish may evaporate or decompose.

Chemical Fate / Biodegradation: No data available.

Other Ecotoxicity information: If water is used for further treatment, the waste water generated by the process must be treated in a water purification plant in compliance with local regulations. If necessary, these finishes can generally be removed in an aqueous medium.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: In its unused condition, this product is not considered to be a RCRA-defined hazardous waste by characteristics or listings. It is the responsibility of the waste generator to evaluate whether his wastes are hazardous by characteristic or listing. Dispose in accordance with all local, state and federal regulations.

NOTE – State and local regulations may be more stringent than federal regulations.

Container Disposal: Containers should be cleaned of residual product before disposal or return. Since emptied containers retain product residue, follow label warnings even after container is emptied. Empty containers should be disposed of or shipped in accordance with all applicable laws and regulations.

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14. TRANSPORT INFORMATION

Shipping Information: Not regulated for transport.

Required Labels: No transport label required.

Environmentally Hazardous Substances [49 CFR 172.101, Appendix A]: None

15. REGULATORY INFORMATION

The components are subject to the following environmental regulatory lists:

Substance Name	CAA	CERCLA	IARC	US State Right-To-Know Lists	CA Prop 65	SARA
Poly-(para-phenylene terephthalamide)	N/R	N/R	N/R	N/R	N/R	N/R

National Chemical Inventories Status:

Substance Name	US TSCA	Canada		EU EINECS	Australia AICS	New Zealand NZIoC	Japan ENCS	Korea KECI	Philippines PICCS	China IECSC
		DSL	NDSL							
Poly-(para-phenylene terephthalamide)	X	X		Polymer		X	X	X	X	X

N/R = Non Regulated

X = Listed / Regulated

Legend

- AICS Australian Inventory of Chemical Substances
- CA List California – Directors List of Hazardous Substances
- Ca Prop 65 California Proposition 65
- CAA Clean Air Act, Section 112
- CERCLA CERCLA Hazardous Substances
- DSL Domestic Substances List – Canada
- EINECS European Inventory of Existing Commercial Chemical Substances
- ENCS Japan Existing and New Chemical Substances
- IARC International Agency for Research on Cancer – Carcinogens – Groups 1, 2A or 2B
- IECSC China – Inventory of Existing Chemical Substances
- IL List Illinois Toxic Substances Disclosure to Employees Act
- KECI Korea Existing Chemicals Inventory
- LA List Louisiana Right-to-Know Reporting List
- MA List Massachusetts – R-T-K Substance List
- MN List Minnesota – Hazardous Substance List
- NDSL Non-Domestic Substances List – Canada
- NJ R-T-K New Jersey – R-T-K Hazard List
- NZIoC New Zealand Inventory of Chemicals
- PA List Pennsylvania Hazardous Substance List
- PICCS Philippines Inventory of Chemicals and Chemical Substances
- RI List Rhode Island – Hazardous Substance List
- SARA SARA Title III, Section 302 / 313
- TSCA Toxic Substances Control Act – USA

CANADA – WHMIS (Workplace Hazardous Materials Information System): Not controlled

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* (CPR) and the MSDS contains all the information required by the CPR.

Other Regulatory Information: None available.

This MSDS contains valuable information critical to the safe handling and proper use of this product. This MSDS should be retained and made available to employees and other users of this product.

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*Twaron® para-Aramid Yarn***16. OTHER INFORMATION**

Other Information: The information given in this Material Safety Data Sheet (MSDS) for Man-made Fibers refers exclusively to the fiber product described herein. It covers neither its use in combination with any other material / preparation / product nor its use in any process.

Changes: Section 3 [Fatty alcohol ethoxylate]

Date of Issue: April 28, 2011

Prepared by: Akzo Nobel Inc.
HSE Business Support
Regulatory Affairs Americas
Tel. 312.544.7000

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SAFETY DATA SHEET

Grafil, Inc.

**SECTION 1
CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

Product Name: Pyrofil™ Carbon Fiber

Product Codes:

MR-35E12LAE	TR-30S-3LALA	TR-50S12LAD	TRH50-24LAL
MR-35E12LAL	TR-30S-6LAL	TR-50S12LAL	TRH506014A
MR-60H24PAD	TR3R5010A	TR-50S15LAD	TRH506015A
MR-60H24PAJ	TR3R5014A	TR-50S-6LAL	
MR-60H24PAL	TR3W5010A	TRH50-12LAL	
MRH60-24PAJ	TR3W5014A	TRH50-18MAD	

Manufacturer's/Distributor's Name: Grafil, Inc.

Manufacturer's/Distributor's Address: 5900 88th Street
 Sacramento, CA 95828 Telephone: (916) 386-1733
 Facsimile: (916) 383-7668

Emergency Telephone Number: (916) 386-1733
 [9:00 am - 5:00 pm, M - F, PST]

Date Prepared: March 26, 2012
 [previous version: December 20, 2011]

**SECTION 2
HAZARDS IDENTIFICATION**

*****Emergency Overview*****

Black continuous carbon fiber. Not expected to present an immediate concern for emergency response personnel. Not expected to present an immediate acute health, reactivity, or flammability hazard. Not expected to present an environmental hazard.

POTENTIAL HEALTH EFFECTS**Hazard symbols:**

Irritant

R-phrases:R36 Irritate to eyes.
R-38 Irritating to skin

SKIN: May cause skin irritation. Mechanical irritation may occur from carbon fiber abrading or becoming imbedded in the skin. Chemical irritation may occur from exposure to sizing present on the carbon fiber.

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

INHALATION: Inhalation exposure to respirable fibers of this product is not expected to occur under normal industrial conditions. Under very limited circumstances, however, exposure to respirable fibers of this product can occur and may result in respiratory tract irritation.

INGESTION: Not expected to occur during industrial activities since ingestion is not a relevant route of exposure.

CHRONIC EFFECTS/CARCINOGENICITY: Not regulated as a carcinogen. There are no chronic effects/carcinogenicity data available on this product. Under very limited circumstances, exposure to respirable fibers of this product can occur and may result in respiratory tract irritation; prolonged exposure may result in more adverse effects. See Section 11 – *Toxicological Information* for information on subchronic toxicity.

NTP: *Not listed*

IARC: *Not listed*

OSHA: *Not listed*

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known.

INCOMPATIBILITY: Not known.

SIGNS AND SYMPTOMS OF EXPOSURE: May result in slight skin and eye irritation.

**SECTION 3
COMPOSITION AND INFORMATION ON INGREDIENTS**

Ingredient	CAS Registry No.	Weight %	Exposure Limits
Carbon fiber	7440-44-0	≥ 99%	See Note 1 below
Epoxy resin	25068-38-6	≤ 1.2%	NE

Notes on Composition and Information on Ingredients

NE = Not established

¹ OSHA and ACGIH have not established air contaminant limits for carbon fibers. Under certain conditions, this substance may be a nuisance dust. OSHA has an 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 3 mg/m³ (respirable fraction) and 10 mg/m³ (inhalable fraction) for particulates not otherwise classified.

² This product contains trace impurities of bisphenol A-(epichlorohydrin), Regulatory information can be found in Section 15.

**SECTION 4
FIRST AID MEASURES**

FIRST AID MEASURES

S-phrases:

- S24 Avoid contact with skin.
- S25 Avoid contact with eyes.
- S28 After contact with skin, wash immediately with plenty of soap-suds.
- S33 Take precautionary measures against static discharges.

SKIN: Wash fibers off of skin with water and soap. If fibers are imbedded in the skin, remove with tweezers. Discard clothing that may contain imbedded fibers. Get medical attention if exposure results in adverse effects.

EYES: Immediately flush with a continuous water stream for at least 20 minutes. Washing immediately after exposure is expected to be effective in preventing damage to the eyes. Get medical attention.

INHALATION: If there is inhalation exposure to the fibers of this product, remove source of exposure and move victim to fresh air. If not breathing give artificial respiration. If there is breathing difficulty, give oxygen. Get immediate medical attention for any respiratory problems.

INGESTION/SWALLOWED: Not expected to occur since ingestion is not a likely route of exposure for this product. If ingestion does occur, do not induce vomiting. Nothing by mouth if unconscious. Get immediate medical attention.

**SECTION 5
FIRE FIGHTING MEASURES**

FLASH POINT: Not applicable

EXPLOSION/FLAMMABLE LIMITS: Not applicable

AUTOIGNITION TEMPERATURE: 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 flammable materials.

SPECIAL FIRE FIGHTING PROCEDURES: As in any fire, wear a self-contained breathing apparatus pressure demand (MSHA/NIOSH approved or equivalent) and full protective gear. Fight fires from a safe distance or protected areas. Fire hoses with fog nozzles may be used for controlling fires but care must be exercised not to spread flaming. Water may not always be effective for large fires.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Under high heat (> 750 °C), this product may react with oxygen to give off carbon oxides and other decomposition products.

OTHER INFORMATION: This product is not expected to burn. Do not incinerate carbon fibers since airborne fibers may cause electrical malfunctions. See Section 13 – *Disposal Considerations* for additional information.

**SECTION 6
ACCIDENTAL RELEASE MEASURES**

SPILL/RELEASE AND CLEANUP PROCEDURES: In case of spill, collect (*e.g.*, sweep up, vacuum, etc.) spilled material and either reuse or dispose of properly. Chopped or milled carbon fibers may be slippery if spilled posing an accident risk. Wear personal protective equipment as described in Section 8 during cleanup activities.

**SECTION 7
HANDLING AND STORAGE**

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Store in a cool, dry place. Wash hands with soap and water after handling. Wear appropriate protective clothing as described in Section 8 during handling activities.

**SECTION 8
EXPOSURE CONTROLS AND PERSONAL PROTECTION**

RESPIRATORY PROTECTION: Normal use and processing of this product are not expected to generate carbon fiber dust. Respirable fibers of this product under certain very limited circumstances can be generated. In such circumstances, HEPA respiratory protection should be used to prevent exposure

PROTECTIVE GLOVES: Latex gloves should be worn when handling this product. Rinse and remove gloves after use, and wash hand thoroughly with soap and water. Gloves should be removed and replaced if there are any signs of degradation or breakthrough.

PROTECTIVE CLOTHING: Wear protective clothing to minimize the potential for skin contact. An emergency shower should be readily accessible. Discard any clothing that has become contaminated.

EYE PROTECTION: Wear safety goggles or glasses when handling or processing this product in any form.

AIR MONITORING: No information is available.

EXPOSURE GUIDELINES: OSHA and ACGIH have not established air contaminant limits for carbon fibers. Under certain conditions, this substance may be a nuisance dust. OSHA has an 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 3 mg/m³ (respirable fraction) and 10 mg/m³ (inhalable fraction) for particulates not otherwise classified.

**SECTION 9
PHYSICAL AND CHEMICAL PROPERTIES**

Appearance:	Black continuous fiber
Odor:	None
Specific Gravity:	1.75 - 1.85
Vapor Pressure:	None
Melting Point:	Not applicable
Solubility in Water:	Insoluble

**SECTION 10
STABILITY AND REACTIVITY**

STABILITY: Stable.

CONDITIONS TO AVOID: None.

INCOMPATIBILITY/MATERIALS TO AVOID: Do not expose to strong oxidizing agents such as fluorine. Carbon fiber can react violently with such compounds.

HAZARDOUS DECOMPOSITION OR BYPRODUCTS: Not expected under normal conditions of processing and use. Thermal decomposition of sizing may begin to occur at high temperatures (> 120 °C) resulting in the release of small amounts of nitrogen oxides, carbon monoxide, organic compounds, and other potentially hazardous substances.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11
TOXICOLOGICAL INFORMATION

ACUTE TOXICOLOGICAL DATA: There are no acute toxicological data available on this product. The oral, dermal, and inhalation acute toxicity are expected to be very low.

EYE IRRITATION DATA: No data are available.

SKIN IRRITATION DATA: No data are available.

SKIN SENSITIZATION DATA: No data are available.

SUBCHRONIC TOXICITY: Two subchronic inhalation tests in rats exposed to carbon fibers have been conducted. In one test, rats were exposed to fibers for 16 weeks. Pulmonary function tests performed on the test animals before necropsy did not show any significant or consistent changes. The only pulmonary finding related to exposure was the occurrence of phagocytosis by alveolar macrophages. No inflammation or fibrosis was observed. In the second study, rats were also exposed to carbon fibers for 16 weeks. Based on clinical signs, no effects due to exposure were observed. Histopathological evaluation revealed non-fibrous particles in the pulmonary lymphoid clearance system and in alveolar macrophages. There were no signs of fibrosis.

REPRODUCTIVE TOXICITY: No data are available.

TERATOGENICITY (birth defects): No data are available.

MUTAGENICITY: Several *in vitro* mutagenicity tests have been performed on carbon fibers. Carbon fibers have been found to be negative in the gene mutation assay in bacteria (Ames test), did not cause sister chromatid exchanges in Chinese hamster ovary (CHO) cells, and did not cause unscheduled DNA synthesis in rat liver cells or forward mutations in studies with CHO cells.

CHRONIC EFFECTS/CARCINOGENICITY: No data are available.

SECTION 12
ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL DATA: No data are available.

ENVIRONMENTAL FATE DATA: No data are available.

PHYSICAL/CHEMICAL PROPERTIES: No data are available.

SECTION 13
DISPOSAL CONSIDERATIONS

RCRA CLASSIFICATION: If discarded in its manufactured form, this product is not expected to be a characteristic or specifically listed hazardous waste under RCRA. However, it is the responsibility of the user to determine at the time of disposal whether a material containing the product or derived from the product should be classified as a hazardous waste.

SPECIAL INSTRUCTIONS: Do not incinerate carbon fibers since airborne fibers may cause electrical malfunctions. Any disposal practices must be in compliance with federal, state, and local requirements.

**SECTION 14
TRANSPORT INFORMATION**

U.S./INTERNATIONAL SHIPPING INFORMATION UNDER DOT/IMO/IATA REGULATIONS: This product is not regulated as dangerous or hazardous goods under DOT, IMO, ICAO, IATA, or UN shipping regulations.

**SECTION 15
REGULATORY INFORMATION**

REGULATORY STATUS: This product, as well as its impurities, may trigger specific reporting, recordkeeping, and testing requirements under TSCA, EPCRA/SARA III, RCRA, CERCLA, CAA, SDWA, and CWA.

CALIFORNIA PROPOSITION 65: This product contains epichlorohydrin, a substance known to the State of California to cause cancer and reproductive toxicity. The maximum level of epichlorohydrin in this product is 2 ppm. This product also contains phenyl glycidyl ether, a substance known to the State of California to cause cancer. The maximum level of phenyl glycidyl ether in this product is 6 ppm. This information is provided to assist users of this product that conduct business in California in discharging any warning obligations that that person may have under California Proposition 65.

OTHER STATE CHEMICAL LISTS: This product contains epichlorohydrin and phenyl glycidyl ether at maximum levels of 2 ppm and 6 ppm, respectively. These chemicals are identified on several state chemical lists.

EPCRA/SARA TITLE III SECTION 313: This compound contains no toxic chemicals at or above the de-minimus threshold subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372.

EU: This product contains a branched nonylphenol ethoxylate sulfated ammonium salt [CAS RN 68649-55-8] which may be present at levels in excess of 0.1% in this product. EU Directive 2003/53/EC establishes certain use and threshold restrictions for nonylphenol and nonylphenol ethoxylates in nine specified sectors. Nonylphenol and nonylphenol ethoxylates may not be placed on the market or used as a substance or constituent of preparations in concentrations equal to or greater than 0.1% by mass for the nine sectors identified under this EU Directive. See EU Directive or applicable national legislation for the nine use sectors. These regulations do not apply to nonylphenol or nonylphenol ethoxylates for research and development or analytical purposes. Contact Grafil for additional information on this requirement.

Canada: This product contains a branched nonylphenol ethoxylate sulfated ammonium salt [CAS RN 68649-55-8] which may be present at levels in excess of 0.1% in this product. Environment Canada published on December 4, 2004 rulemaking to reduce discharges and use of nonylphenol and nonylphenol ethoxylates in certain use sectors. Canada Gazette Vol. 138, No. 49. See Canadian regulations for the specific use sectors. Companies subject to this rule are required to track their volumes, make threshold calculations, and reduce their use of nonylphenol and nonylphenol ethoxylates. Contact Grafil for additional information on this requirement.

SECTION 16
OTHER INFORMATION

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