

**KEVLAR<sup>®</sup>**  
ARAMID

**Fiber Products**

**Material  
Safety  
Data  
Sheet**



OCTOBER 1989



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This MSDS is provided to comply with provisions of the Hazard Communication Standard (29 CFR 1910.1200).

## 1 Material Identification

Name: KEVLAR® aramid fiber—Du Pont

### Trade Names/Synonyms:

KEVLAR Aramid Yarn  
 KEVLAR Aramid Staple  
 KEVLAR Aramid Pulp  
 KEVLAR Aramid Floc  
 KEVLAR Aramid Fabric

### TSCA Inventory Status:

Reported/Included

### Manufacturer/Distributor:

E. I. du Pont de Nemours & Co. (Inc.)  
 1007 Market Street  
 Wilmington, DE 19898  
 Date Prepared: 7/26/89  
 Preparer: E. A. Merriman  
 1-800-453-8527

### Transportation Emergency Phone:

CHEMTREC: 1-800-424-9300

### Medical Emergency Phone:

1-800-441-3637

## 2 Components

Material	CAS Number	%
Poly(terephthaloylchloride/ p-phenylenediamine)	26125-61-1	>89
Water, absorbed (pulp shipped as wetlap contains up to 35%-50%)	7732-18-5	< or = 7
Sodium sulfate in KEVLAR pulp in other forms	7757-82-6	<0.1 <2
Finish	None	<2
Wax overlay, in addition to above, on yarn types 960, 978 only	6474-43-4	<10

### 3 Physical Data

- Melting Point: Does not melt.  
Solubility in Water: Insoluble in water.  
Odor: Odorless.  
Color: Gold.  
Specific Gravity: 1.44  
Form: Solid—continuous multi-filament yarns, staple, cut floc, pulp, fabric.  
% Volatiles: < 9%, water and finish. (<50% water, <.5% finish in pulp wetlap)

### 4 Hazardous Reactivity

- Instability: Stable at normal temperatures and storage conditions.  
Incompatibility: None reasonably foreseeable.  
Polymerization: Polymerization will not occur.  
Decomposition: KEVLAR® begins to decompose at about 800°F (~400°C), in air by oxidation. Heat generated by laser cutting of fabric of KEVLAR or of laminates containing KEVLAR generates a variety of toxic offgases, some of which may cause irritation of the respiratory tract.

### 5 Fire and Explosion Data

KEVLAR fiber is inherently flame resistant, but can be ignited (limiting oxygen index = 29); burning normally stops when the ignition source is removed. Pulp or dust accumulations may continue to smolder if once ignited.

Dust of KEVLAR does not present an explosion hazard.

#### • Fire and Explosion Hazards

Burning KEVLAR produces combustion gases similar to those from wool—mostly carbon dioxide, water and oxides of nitrogen; however carbon monoxide, small amounts of hydrogen cyanide and various other toxic gases are produced, depending on conditions of burning.

#### • Extinguishing Media

Water. Chemical Foam. Dry Chemical. CO<sub>2</sub>.

#### • Special Firefighting Instructions

Wear self-contained breathing apparatus.

## 6 Health Hazard Information

As shipped, KEVLAR® aramid fiber products do not pose a hazard. KEVLAR staple and pulp contain a small amount of respirable fibers which may become airborne during opening, mixing, carding, or regrinding waste products containing KEVLAR. When mechanically working KEVLAR fiber or materials containing KEVLAR in operations such as cutting, machining, grinding, crushing, or sanding, airborne respirable fibers may be formed. Repeated and prolonged inhalation of excessive concentration of respirable fibers may cause permanent lung injury.

### • Animal Data

KEVLAR fiber is not a skin irritant, is untested for eye irritancy and is not a skin sensitizer in animals. By ingestion, the fiber has very low acute oral toxicity with no deaths observed in animal feeding studies at dose levels up to the maximum, 7500 mg/kg.

Oral ALD: >7500 mg/kg in rats

In a two-week inhalation study (1983), respirable KEVLAR fibers at concentrations of 1000-2000 fibers per cubic centimeter caused mild, nonprogressive fibrosis (lung scarring that shrinks with cessation of exposure), and nonspecific effects such as weight loss and irritation, but no permanent effects at concentrations of 400 fibers per cubic centimeter.

A two-year inhalation study (1985) with KEVLAR pulp (refined to increase its respirable fiber content) showed mild fibrosis at concentrations of 25 fibers per cubic centimeter and lung tumors (cystic keratinizing squamous cell carcinomas) in some rats in the group exposed to respirable fibers at concentrations of 100 fibers per cubic centimeter. This is a unique type of tumor not found in humans and may be indicative of a nonspecific biological response to the

respirable material rather than an indication of KEVLAR toxicity. No lung tumors and no fibrosis were seen in animals exposed to 2.5 respirable fibers per cubic centimeter for two years.

At no concentrations were fibers found to have migrated beyond the lungs and associated lymph system. Abdominal cavity tumors have been observed in two studies where rats were administered KEVLAR by intracavity injection. For additional details, see References.

### • Human Data

Skin sensitization has not been observed in human skin tests. The mechanical action of the fibers may cause slight skin irritation at clothing binding points and mild irritation of the eyes and nasal passages. Overexposure to the respirable fibers by inhalation may cause mild and temporary upper respiratory irritation with discomfort or cough. Based on animal testing, prolonged and repeated exposure to excessive concentrations of respirable fibers may cause permanent lung injury.

Workplace exposure measurements: Measured levels of airborne respirable fibrils (sub-fibers) from handling and processing KEVLAR pulp and filament yarn are typically 0.3 fibrils/cc, or less, 8-Hour Time Weighted Average (TWA). The normally low airborne dust levels result from the inherent tendency of KEVLAR fibrils to clump together—they have high surface static charges and their branched shapes readily interlock.

Staple spinning operations, with their high potential for fiber abrasion can produce levels of 1-3 respirable fibers/cc unless air handling is well designed and maintained. In all processing of KEVLAR, the use of compressed air to clean equipment can temporarily increase the airborne fibril concentrations markedly. Equipment should be vacuumed or wiped instead.

## 7 Exposure Limits

	KEVLAR®: respirable fibers	KEVLAR: dust	Particulates not otherwise regulated
AEL* (Du Pont)	2 respirable fibers/cc	5 mg/m <sup>3</sup> total dust	—
TLV** (ACGIH)	None established	None established	—
PEL (OSHA)	None established	None established	15 mg/m <sup>3</sup> total dust 5 mg/m <sup>3</sup> respirable dust

\* AEL is Du Pont's Acceptable Exposure Limit.

\*\* TLV is a registered trademark of the American Congress of Governmental Industrial Hygienists.

## 8 Carcinogenicity

None of the components in this material is listed by IARC, NTP, OSHA, or ACGIH as a carcinogen. See Animal Data discussed above.

## 9 Safety Precautions

Avoid breathing fibers or dust. Follow good industrial hygiene practices for ventilation and clean-up; in particular avoid the use of air jets to blow off equipment; use vacuum cleaners with high efficiency particulate air (HEPA) filters instead.

Do not handle moving threadlines of KEVLAR, as entanglement with a high strength fiber can severely cut or even sever fingers.

## 10 First Aid

### • Inhalation

If large amounts of fibers are inhaled, remove to fresh air. If breathing is difficult, give oxygen, and call a physician.

### • Skin Contact

If fibers irritate the skin, wash with soap and water.

## 11 Protection Information

### • Generally Applicable Control Measures and Procedures

If the fibers or parts made from the fibers are cut or otherwise mechanically worked, dusts and fibers may be generated. Where technically feasible, use engineering controls such as isolation, enclosures, exhaust ventilation, wetting, and dust collection systems wherever necessary to control airborne respirable fiber exposures below applicable limits.

Loose fitting clothing that is routinely washed is recommended to reduce build up of fibers at chafing points.

Laser cutting of fabric of KEVLAR or of laminates containing KEVLAR or machining that produces smoke should be well exhausted or ventilated to remove fumes from the workplace.

Water jet cutting of fabric or composites of KEVLAR produces fibrils in the cutting waste. If dried, this waste can become a source of airborne respirable fibers. Rinse or wipe waste from work surfaces and parts.

### • Personal Protective Equipment

#### Eye/Face Protection

When cutting or mechanically working this product, wear safety glasses or coverall goggles.

#### Respirators

When cutting or mechanically working this product, wear NIOSH/MSHA-approved respiratory protection if there is potential for airborne exposures in excess of applicable limits, or if there is potential for irritation of the nasal passages to occur due to the mechanical action of the fibers.

## 12 Disposal Information

### • Spill, Leak, or Release

Use appropriate Personal Protective Equipment during clean up. Wash, shovel or sweep up and place in solid waste containers. Clean up dusts and fibers with high efficiency particulate air (HEPA) filtered vacuum equipment.

### • Waste Disposal

KEVLAR® is not a hazardous waste as defined by regulations implementing the Resource Conservation and Recovery Act (RCRA). In general, KEVLAR waste materials may be discarded in accordance with the State and Local regulations governing the disposal of other common or non-RCRA regulated waste materials.

## 13 Shipping Information

### DOT

Proper Shipping Name: None, non-regulated

## 14 Storage Conditions

KEVLAR dry pulp should be stored with 4-8% absorbed moisture to control static charge.

### • Storage

Boxes of yarn  
Bales of staple  
Bags of pulp  
Rolls of wetlap  
Rolls of fabric

## 15 Additional Information

This MSDS is provided to comply with provisions of the Hazard Communication Standard (29 CFR 1910.1200).

*Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III:* KEVLAR contains no toxic chemicals as regulated under section 313 Emergency Planning and Community Right-to-Know Act (EPCRA) of SARA Title III and 40 CFR part 372. KEVLAR is not regulated as hazardous waste under CERCLA and is not subject to the Superfund tax.

*California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):* KEVLAR 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:* KEVLAR is not subject to provisions of the Pennsylvania and New Jersey Right-to-Know laws.

## 16 References

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.

Vu, V.T., *Health Hazard Assessment of Non-Asbestos Fibers (Final Draft)*, Office of Toxic Substances, U.S. Environmental Protection Agency, (Dec. 30, 1988), 20-21, 152-164.