

**Material Safety Data Sheet (Kevlar)**

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**Product Identification**

Product name: Kevlar® Aramid Fiber

**Composition Information / Ingredients**

Ingredient Name / CAS Number	Concentration
Poly(terephthaloylchloride/p-phenylenediamine) (para-aramid polymer) CAS number 26125-61-1	>89%
Water, absorbed Pulp wet-lap CAS number 7732-18-5	0-7% 35-50%
Sodium sulfate in Kevlar® pulp: In other forms: CAS number 7757-82-6	<0.1% <2%
Finish	<2%

**Hazardous Material Identification****Emergency Overview:**

Kevlar® aramid fiber is a golden yarn, staple, 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 respirator to minimize fibril inhalation. During a fire, these Kevlar® products are likely to pose a respirable fibril hazard, but may release toxic and irritating gases, much like those of 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 non-biodegradable and nontoxic to aquatic life; they pose no unusual environmental hazard in a spill or fire.

**Potential Health Effects:**

Eyes: fiber fly and dust may cause slight mechanical irritation.

Skin: continual rubbing of fibers and fiber pieces on skin (as when 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 concentrations repeatedly over long periods of time may cause lung injuries (fibrosis).

Cancer: Kevlar® fibrous dust did not cause cancer in long-term animal inhalation studies. [See the Toxicology section and references contained in the "other information" section of this MSDS.] None of the components present in this material concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

**Emergency and first aid procedure**

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

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

**Fire and explosion hazard 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 and dust accumulations may continue to smolder once ignited. Kevlar® fiber dust does not present an explosion hazard.

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.

**Caution:** If permitted to dry, pulp can become electrostatically charged during processing and handling. Electrostatic discharge may cause ignition of nearby flammable vapors. Close package tightly after opening to retain moisture.

**Extinguishing Media:** water, foam, and dry chemical, CO<sub>2</sub>

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

**Accidental release measures**

Wash, shovel or mop up and place in solid waste containers. Fiber is not biodegradable; do not flush to drains.

Clean up Kevlar® dusts and pulp with high efficiency particulate air (HEPA) filtered vacuum equipment, or by wet cleaning. Avoid the use of dry air jet blowing of fibers and dust, which can re-suspend respirable dust in the air.

**Special precautions and storage data**

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

Kevlar® is degraded by ultraviolet light. Do not store in direct sunlight. Fluorescent lighting will cause discoloration, but will not affect fiber mechanical properties. Kevlar® dry pulp is packaged in moisture-proof bags or bales to prevent drying to less than 4% moisture and possible pick-up of electrostatic charge. If package is punctured, re-moisture pulp to 4-8% moisture before using. Kevlar® pulp wet-lap is packaged in moisture-proof film. If film is punctured, the percent of moisture in that package will be reduced nonuniformly. This can cause variations in dry fiber content when weighing out wet-lap.

**Personal protection**

Respiratory: Respirator use must be in accordance with OSHA Standard 29 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 actions of the fibers, NIOSHA/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 may also be used.

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

Skin: 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.)

**Physical properties**

Flash point: not applicable

Auto ignition: not applicable

Explosive limits: not applicable

Melting point: does not melt

Solubility in water: insoluble in water

Odor: odorless

Specific Gravity: 1.45 g/cc

Color: golden

Form: solid: yarn, felt, fabric, paper, pulp, floc, staple

% Volatiles: <9% water and finish. Wet-lap pulp has <50% water

**Stability and reactivity**

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

**Toxicological information**

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

Skin: Kevlar® fiber is not a skin irritant, or a skin sensitizer in animals. None of three test using guinea pigs produced sensitization. Skin sensitization has not been observed in human patch tests 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.

Oral: Kevlar® has low toxicity by ingestion. Oral ALD>7500 mg/kg in rats.

Inhalation: In a two week inhalation study with rats (1983), respirable Kevlar® fibrils (subfibers) at concentrations of 1000-2000 fibrils per cubic centimeter (f/cc) caused mild, non-progressive fibrosis (lung scarring that shrinks with cessation of exposure) and nonspecific effects such as weight loss and irritation. There were no permanent effects at concentrations of 280 f/cc or less. A two year inhalation study with Kevlar® pulp (refined to increase its respirable fibril content) showed fibrosis at concentrations 25,100, and 400 f/cc, and lung lesions in some rats in the group exposed to respirable fibers at concentrations of 100 and 400 f/cc. To further characterize these lesions (previously identified as cystic keratinizing squamous cell carcinomas) a panel of 12 pathologist 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 found in humans and may be indicative 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 into the lungs and associated lymph system. Four experiments at fibril concentrations of 2.5 to 400 f/cc have shown 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 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 indicates it would be unlikely that human exposures would approach levels that cause 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 test has been run to define mutagenic, development or reproductive hazards.

**Ecological information**

Kevlar® fibers are essentially nonbiodegradable in the environment, and do not leach material toxic to flora or fauna. Finishes and additives used with Kevlar® are routinely tested for their potential effects on manufacturing wastewater systems. Biocompatibility and aquatic toxicity tests give the following results:

- None 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.

**Disposal considerations**

Kevlar® aramid fiber is not 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 state and local regulations governing the disposal of other common or non-RCRA regulated waste material. Waste such as waterjet cutter sludge or duct from air filters may be enriched in respirable fibers. Bag securely, label as containing respirable fibers and dispose of it as non-hazardous industrial waste. Since the fiber is essentially nonbiodegradable, it should not be flushed to surface waters or sanitary sewer systems.

**Shipping information**

DOT shipping name: none

DOT hazard classification: none

UN/NA number: none

Packaging group: none

DOT labels required: none

DOT placards required: none

Freight class: 65

**Regulatory information**

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

**EPA:**

**TSCA:** Kevlar® fiber products are listed on the TSCA inventory.

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

**SARA Title III, Section 313:** non-reportable

**Clean Air Act 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 either Class I (chlorofluorocarbons, halons, carbon tetrachloride, and methyl chloroform) 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.

**State Regulations:**

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): Kevlar® fiber contains none of the substances known to the State of California to cause cancer or reproductivity toxicity.

Pennsylvania and New Jersey Right-to-Know Laws: Kevlar® fiber is considered an "article" and not subjects to the provisions of the Pennsylvania and New Jersey Right-to-Know laws.

**International Regulations:**

Canada: This material is not WHMIS controlled. This material is not TDG regulated.

**Other information**

This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of Industrial Polymers, Inc. The data on this sheet relates only to the specific material designated herein. Industrial Polymers, Inc. assumes no legal responsibility for use or reliance upon this data.

Prepared by: C. Boddie

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