



SDS Number: HX05-1

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SECTION 1 • PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME OR NUMBER:

- **HYTEX®-500** textiles; woven, knit, non-woven cloth, tape, rope, sleeving, yarn, thread and fiber. Note: All HYTEX-500 products are made from DuPont Nomex® fibers and yarns.
- **THERMOPAK®** custom fabricated products are made using one of one or more of the above listed products.

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SECTION 2 • HAZARDS IDENTIFICATION

GENERALLY APPLICABLE CONTROL MEASURES AND PROCEDURES:

HYTEX® 500 (Nomex) fibers may contain from 0.2% to 3.0% dimethylacetamide (DMAC). Processing and handling may result in exposure via skin absorption and inhalation. Prolonged and repeated overexposure to DMAC can cause liver damage.

Wash hands after handling. Avoid exposure to hot processing in confined spaces. Use adequate ventilation. Industrial experience shows that minimal absorption to DMAC occurs at room temperature handling. DMAC can be released by heating the fibers above 392°F (200°C) or by extracting them with liquids, especially during dyeing. HYTEX® 400(Kevlar) and HYTEX® 500(Nomex) fibers are non-biodegradable and non-toxic to aquatic life; they pose no unusual environmental hazard in a spill or fire.

SECTION 3 • COMPOSITION / INFORMATION ON INGREDIENTS

CHEMICAL / COMMON NAME	C.A.S. NUMBER	% BY WEIGHT (opt) (based on dry weight)
• Aramid Staple Fiber: Poly(m-phenylenediamine isophthalamide) (Nomex meta-aramid polymer)	25765-47-3	73-99.5
• Aramid Staple Fiber: Poly(p-phenylenediamine terephthalamide) (Kevlar® para-aramid polymer)	26125-61-1	0-60
• N, N-dimethylacetamide (DMAC) For 1.5 dpf fiber For 2.0 dpf fiber For >2.0 dpf fibers	127-19-5	<1 <2 <3
• Finishes		<2
• Colorants		0-4

EXPLANATION OF THE REFERENCE TO KEVLAR: HYTEX® 500(Nomex) fibers are generally produced as 100% Nomex, however, there are varieties of this fibers that is produced as a blend with Kevlar, up to 60% by weight.

• PSA: The products listed in Section-1 may be provided with an Acrylate Pressure Sensitive Adhesive (PSA) applied, along with a release paper. There are no known hazardous components associated with the PSA provided. There may be slight smoking and a characteristic odor if the PSA is heated to a point where decomposition occurs; however, no adverse health effects are anticipated. The components of the PSA are in compliance with the chemical notification requirements of TSCA.

SECTION 4 • FIRST-AID MEASURES

EYE CONTACT: In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation persists or develops later.

INHALATION: If large amounts of fumes, dust or fibers are inhaled, remove to fresh air. If persistent cough or other symptoms develop, get medical attention. If exposed to excessive levels of DMAC, remove to fresh air and get medical attention if symptoms persist.

SKIN CONTACT: Wash with soap and water. Wash contaminated clothing and gloves 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 gastrointestinal distress, following accidental ingestion, call a physician.

SECTION 5 • FIRE-FIGHTING MEASURES

AUTO IGNITION TEMPERATURE: N/A

HYTEX® 500 (Nomex) fiber is inherently flame-resistant but can be ignited (limiting oxygen index approx. 28).

FIRE AND EXPLOSION HAZARDS: When forced to burn, HYTEX® 400(Kevlar) and HYTEX® 500(Nomex) fibers produce hazardous



gasses similar to those from wool. These are most commonly carbon dioxide, water, and oxides of nitrogen. However, carbon monoxide, small amounts of hydrogen cyanide, and various other chemical residues (some possibly toxic or irritating) may be produced, depending on conditions of burning. Off gasses from thermal decomposition of some fiber lubricants may contain very small amounts of such chemicals as formaldehyde, ethanol, acetic acid, acetone, etc. The conditions would not be expected to reach concentrations that present a significant health hazard. Small amounts of visible smoke are produced during combustion in air. Fiber dusts from either material dies not present an explosion hazard.

EXTINGUISHING MEDIA: Water, foam, carbon dioxide (CO₂), or dry chemical.

SPECIAL FIRE FIGHTING INSTRUCTIONS: Wear self-contained breathing apparatus.

SECTION 6 • ACCIDENTAL RELEASE MEASURES

Review FIRE-FIGHTING MEASURES and HANDLING sections before proceeding with cleanup. (Sections 5 & 7)

Wash, shovel, or mop up fibers and place in solid waste containers. Avoid the use of dry sweeping with air-jet blowing of fibers and dust; these can re-suspend respirable dust in the air. Clean up dusts containing HYTEX[®] 400 (Kevlar) fibrils with high-efficiency particulate air (HEPA) filtered vacuum equipment, or by wiping or wet cleaning.

Fibers are not biodegradable; do not flush to drains.

SECTION 7 • HANDLING AND STORAGE

Do not touch moving threadlines of HYTEX[®] 400 (Kevlar) or HYTEX[®] 500 (Nomex). Entanglement with these high-strength yarns can severely cut or even sever fingers.

HYTEX[®] 400(Kevlar) and HYTEX[®] 500(Nomex) are degraded by ultraviolet light. Do not store in direct sunlight. Fluorescent lighting will cause discoloration, but will not affect fiber mechanical properties.

Waste disposal: HYTEX[®] 400(Kevlar) and HYTEX[®] 500(Nomex) are not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). In general, dispose in accordance with all federal, state, & local laws.

SECTION 8 • EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS/WORK PRACTICES

Avoid breathing fibers, dust and fumes. Follow good industrial hygiene practices for ventilation during cleanup. In particular, avoid the use of air jets to blow off equipment.

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

PERSONAL PROTECTIVE EQUIPMENT/PROTECTIVE MEASURES

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

EYE PROTECTION: Splash-proof goggles are useful to prevent eye contact if there is potential for exposure to DMAc.

PROTECTIVE CLOTHING: Impervious gloves, aprons, and other protective clothing as a preventative measure in case of potential exposure to DMAc.

EXPOSURE GUIDELINES:

<u>COMPONENT</u>	<u>OSHA - PEL</u>	<u>ACGIH - TLV</u>
• HYTEX 400(Kevlar)	NE	NE
• HYTEX 500(Nomex)	NE	NE
• DMAc	10ppm, 35 mg/m ³ 8-hr TWA, Skin.	10ppm, 36 mg/m ³ 8-hr TWA, skin, A4.

SECTION 9 • PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: Solid – continuous multi-filament yarns with a wide range of total denier and staple of varying denier per filament and cut length.

COLOR AND ODOR (natural state): Off white, mild to no odor.

pH: N/A

MELTING POINT: Does not melt. Thermal degradation with loss of product strength begins above 572°F.

BOILING POINT: N/A

FLASH POINT: N/A

EVAPORATIVE RATE (n-Butyl Acetate = 1): N/A

EXPLOSIVE LIMITS: N/A

VAPOR PRESSURE: (mm Hg @ 20°C): N/A

PERCENT SOLUBILITY IN WATER: Insoluble in water. Soluble in DMAc.

SPECIFIC GRAVITY (water = 1): 1.38

VISCOSITY: N/A

PERCENT VOLATILE BY VOLUME: N/A

POUR POINT: N/A

SECTION 10 • STABILITY AND REACTIVITY

STABILITY: Stable under normal conditions of use.

INCOMPATIBILITY: None are reasonably foreseeable.

HAZARDOUS DECOMPOSITION PRODUCTS: Begins to thermally degrade rapidly above 572°F. The thermal degradation rate increases with temperature. (See section 4)

HAZARDOUS POLYMERIZATION: Polymerization will not occur.

SECTION 11 • TOXICOLOGICAL INFORMATION

EYE EFFECTS: HYTEX[®] 500(Nomex) and HYTEX[®] 400(Kevlar) are untested for eye irritancy. As with other particles, mechanical action of fibers in the eye may cause slight irritation.

DMAc is an eye irritant in animals and man. Eye contact may include eye irritation with discomfort, tearing, or blurring of vision.

SKIN EFFECTS: HYTEX[®] 500(Nomex) and HYTEX[®] 400(Kevlar) brand fibers are not skin irritants, or skin sensitizers in animals. None of three tests using guinea pigs produced sensitization (HYTEX[®] 400(Kevlar)).

Skin sensitization has not been observed in human patch tests or in industrial experience. HYTEX[®] 500(Nomex) and HYTEX[®] 400(Kevlar) fiber have 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 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.



DMAC skin absorption toxicity: ALD50 for rabbits is 2240mg/kg (moderately toxic by skin absorption). DMAC is a skin irritant, but not a skin sensitizer in animals. In humans, skin contact can cause irritation with discomfort or rash.

ACUTE ORAL EFFECTS: HYTEX® 500(Nomex) and HYTEX® 400(Kevlar) have very low toxicity by ingestion. Oral ALD >7500mg/kg in rats.

DMAC is slightly toxic by ingestion. ALD50 is 4930mg/kg in female rats.

*NOTE: Keep in mind that the effects of DMAC cited in this SDS are exposure dependent, and may not appear except at significant exposures. Because the DMAC in HYTEX® 500(Nomex) is not readily available at room temperature, typical workplace handling has only produced levels of absorbed DMAC that are well below levels at which health effects occur.

ACUTE INHALATION EFFECTS: Industrial experience shows that inhalation of fibrous dust may cause mechanical irritation of the mucous membranes of the nose and throat with resulting dry cough, scratchy throat, and runny nose. Symptoms cease upon cessation of exposure.

DMAC skin absorption toxicity: ALD for rabbits, when applied in single doses, is 5000mg/kg body weight.

Human health effects of overexposure to DMAC by inhalation or skin absorption may initially include nonspecific discomfort such as nausea, headache, or weakness: temporary nervous headache, confusion, loss of coordination and loss of consciousness: abnormal liver and kidney functions as detected by laboratory tests or jaundice (liver). Skin permeation occurs rapidly and can occur in amounts capable of producing the effects of systemic toxicity. There are not reports of human sensitization. Individuals with pre-existing diseases of the liver may have increased susceptibility to the toxicity of excessive exposure.

SUBCHRONIC INHALATION EFFECTS: In a two week inhalation study with rats (1983), respirable fibrils (sub fibers) of Kevlar 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 are no effects at concentrations of 280f/cc or less.

A two-week sub chronic test in which mice were exposed to DMAC via inhalation showed liver and testicular effects at high exposure concentrations (300, 500, and 700ppm). No adverse effects were observed at 100ppm.

CHRONIC INHALATION EFFECTS: Nomex and Kevlar fibers: Nomex fiber does not break down into fibrils when abraded, instead it produces non-fibrous particles. A 2.5mg dust sample of Nomex, prepared by grinding Nomex paper was instilled once into rat lungs. Tissue response was measured histopathologically in groups of rats at periodic sacrifices from 2 days to 2 years. No sign of adverse response to the Nomex dust was seen.

A two year inhalation study with Kevlar pulp (refined to increase its respirable fibril content) showed fibrosis at concentrations of 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. A panel of 12 pathologists from North America and Europe reviewed these lesions 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 (and very little at 25f/cc). At no concentrations were fibers found to have migrated beyond the lungs and associated lymph system. Four experiments at fibril concentrations of 2.5 f/cc to 400 f/cc have shown that fibrils of Kevlar in the lungs of rats are shortened with time, probably by enzymatic clipping of the polymer chain. (This effect has been independently confirmed in rats by two other laboratories and by DuPont in hamsters. In-vitro tests show fibrils of Kevlar are shortened in proteolytic enzyme solutions). While not all fibrils disappear, long fibers are cut to an average of less than 5 micrometers and gradually removed. The lower the exposure, the faster fibrils are broken down.

IARC completed an in-depth review of all valid scientific data relating to para-aramid fibrils in October, 1996. They classified the fibrils as in Group 3, "not classifiable as to their carcinogenicity to humans". That is, the experts found no convincing evidence of carcinogenicity. (While IARC has no regulatory authority, its expert options are used for guidance by regulatory authorities worldwide).

DMAC: Toxic effects described in animals from exposure by inhalation, ingestion, or skin contact include retinal, liver, lung, and kidney effects, reduced spermatogenesis, bone marrow effects, and ataxia. Tests in animals demonstrate no carcinogenic activity.

If there is significant potential for skin contact with DMAC biological monitoring should be done to measure the level of DMAC metabolites in urine specimens collected at the end of the shift. It is DuPont practice to limit individual end-of-shift DMAC metabolites in urine levels to 40ppm or below, expressed as mono-methylacetamide (MMSc) and to control average DMAC metabolite in urine levels for the job to 20pm below, expressed as MMAC.

MUTAGENIC, DEVELOPMENTAL AND REPRODUCTIVE EFFECTS: Fibers: In an in vitro assay, fibrils of HYTEX® 400(Kevlar) produced no chromosomal aberrations in cultured human peripheral blood lymphocytes.

No animal tests have been run to define mutagenic, developmental or reproductive hazards of either Nomex or HYTEX® 400(Kevlar) fibers.

DMAC: Tests in mammalian cell cultures demonstrate no mutagenic activity. In laboratory tests, application of DMAC to the skin of pregnant rats has caused fetal deaths when the doses were close to the lethal dose level for the mother. Embryonal malformations have been observed at dose levels 20% of the lethal dose and higher. However, when male and female rats were exposed to mean concentrations of DMAC at 31 ppm, 101 ppm, and 291 ppm for 6 hours per day over several weeks, no reproductive effects were observed.

SECTION 12 • ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION: HYTEX® 500(Nomex) and HYTEX® 400(Kevlar) fibers are essentially non-biodegradable in the environment, and do not leach material toxic to flora or fauna. Finishes and additives used in the production of Nomex fiber are routinely tested for their potential effects on manufacturing wastewater treatment 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 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 13 • DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: HYTEX® 400(Kevlar) and HYTEX® 500(Nomex) are not a hazardous waste as defined by regulations implementing the Resource Conservation and Recovery Act (RCRA). In general, waste materials may be discarded in accordance with state and local regulations governing the disposal of other common or non-RCRA-regulated waste materials.

DMAC in wastewater streams contributes to the Biological Oxygen Demand (BOD) but is readily biodegradable in conventional biological sewage treatment systems. Wastewater containing DMAC should be disposed of in accordance with state and local wastewater discharges.

SECTION 14 • TRANSPORTATION INFORMATION

N/NA CODE: None.

PROPER SHIPPING NAME: Not regulated.

HAZARD CLASS: Non-hazardous.

DOT INFORMATION: Not regulated.

LABELS REQUIRED: None.

BILL OF LADING DESCRIPTION: Product name.

SECTION 15 • REGULATORY INFORMATION

US FEDERAL REGULATIONS

OSHA: This SDS is provided to comply with [provisions of the Hazard Communication Standard (29CFR1910.1200).

TSCA: Nomex fiber products are listed on the TSCA inventory.

CERCLA: HYTEX® 500/Nomex is not regulated as a hazardous waste under CERCLA and is not subject to the Superfund tax.

SARA TITLE III INFORMATION: HYTEX® 500 Nomex may contain small amounts of DMAC which is regulated under section 313 Emergency Planning and Community Right-To-Know Act (EPCRA) of SARA TITLE III.

CLEAN AIR ACT AMENDMENTS OF 1990: Nomex aramid fiber products do not contain, nor are they manufactured with, any of the ozone-depleting substances listed in either Class I (chlorofluorocarbons, halons, carbon tetrachloride, and methyl chloroform) or Class II (hydrochlorofluorocarbons) of the Clean Air Act Amendments of 1990.

STATE REGULATIONS

California Safe Drinking Water and Toxic Enforcement Act of 1986 (prop 65): Nomex fiber 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: Nomex fiber is considered an "article" and is not subject to the provisions of these laws.

CANADIAN REGULATIONS

This material is not WHMIS controlled.

This material is not TGD regulated.

SECTION 16 • OTHER APPLICABLE INFORMATION

NFPA & NPCA-HMIS RATINGS

	NFPA	NPCA-HMIS
Health	0	0*(chronic health effects)
Flammability	1	1
Reactivity	0	0

- Nomex® and Kevlar® are registered trademarks of the E.I. du Pont de Nemours and Company.
- REFERENCE: DuPont Material Safety Data Sheet No. SP6001, Nomex® Brand Fiber, DuPont Advanced Fibers Systems.

DEFINITIONS

29 CFR 1910.134 & 1926.103:	OSHA Respiratory Protection Standards
29 CFR 1910.1200 & 1926.59:	OSHA Hazard Communication
ACGIH	American Conference of Governmental Industrial Hygienists
ADR	Carriage of Dangerous Goods by Road (International Regulation)
CAA	Clean Air Act
CAS	Chemical Abstract Services
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
DOT	Department of Transportation
DSL	Domestic Substances List (Canada)
EEC	European Economic Committee
EINECS	European Inventory of Existing Commercial Chemical Substances
EPA	Environmental Protection Agency
EU	European Union
HEPA	High Efficiency Particulate Air
HMIS	Hazardous Materials Information System
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods Code
LC	Lethal Concentration
LD	Lethal Dose
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PIN	Product Identification Number
PNOC	Particulates Not Otherwise Classified
PNOR	Particulates Not Otherwise Regulated
RCRA	Resource Conservation and Recovery Act
RID	Carriage of Dangerous Goods by Rail (International Regulation)
SARA	Superfund Amendments and Reauthorization Act
STEL	Short Term Exposure Limit
TCLP	Toxic Chemical Leachate Program
TDG	Transportation of Dangerous Goods
TITLE III EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW ACT – SECTION:	
302	Extremely Hazardous Substances
303	Emergency Release
311	SDS/List of Chemicals
312	Emergency and Hazardous Inventory
313	Toxic Chemicals Release Reporting
TLV	Threshold Limit Value
TSCA	Toxic Substance Control Act
TWA	Time Weighted Average



WHMIS Workplace Hazardous Materials Information System

µm micrometer (micron)
mm millimeter
cm centimeter
m meter
f/cc fibers per cubic centimeter
ml milliliter
in inch
oz ounce
lb pound
µg microgram
mg milligram

g gram
kg kilogram
µg/cm² micrograms per centimeters squared
mg/m³ milligrams per cubic meter of air
mppcf million particles per cubic foot
ppm parts per million

N/A Not Applicable
ND No Data/Not Determined
NE Not Established
NR Not Regulated

To the best of our knowledge, the information contained in this publication is accurate; however, we do not assume any liability whatsoever for the accuracy or completeness of such information. Moreover, there is a need to reduce human exposure to many materials to the lowest practical limits in view of possible long term adverse effects. To the extent that any hazards may have been mentioned in the publication, we neither suggest nor guarantee that such hazards are the only ones that exist. Final determination of the suitability of any information or product for the use contemplated by any user, the manner of that use, and whether there is any infringement of any patents is the sole responsibility of the user. We recommend that anyone intending to rely on any recommendation or to use any equipment, processing technique, or material mentioned in this publication should satisfy himself as to such suitability and that he can meet all applicable safety and health standards. We strongly recommend that users seek and adhere to the manufacturers' or suppliers' current instruction for handling each material they use.

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