

UAW™

Unidirectional Aramid Wrap



Building
&
Transportation



Oil, Gas
&
Industrial



Offshore
&
Onshore



Water
&
Wastewater



PRODUCT DESCRIPTION

CTech-LLC® Unidirectional Aramid Wrap **UAW™**, or known by many as Kevlar belongs in a family of synthetic products characterized by strength some five times stronger than steel on an equal weight basis and heat-resistance some more than 500 degrees Celsius. It is appropriate for various applications such as composites, ballistics, aerospace, automotive, protective clothing against heat/radiation/chemicals, asbestos substitute, telecommunications optical fiber cables and many other.

The word aramid comes from a blend of the words "aromatic" and "polyamide" and is a general term for a manufactured fiber in which the fiber forming substance is a long chain synthetic polyamide, in which at least 85% is of amide linkages (-CO-NH-) attached directly to two aromatic rings.

ADVANTAGES

Aramid main advantages are high strength and low weight. Like graphite, it has a slightly negative axial coefficient of thermal expansion, which means aramid laminates can be made thermally stable in dimensions. Unlike graphite, it is very resistant to impact and abrasion damage. It can be made waterproof when combined with other materials like epoxy. It can be used as a composite with rubber retaining its flexibility.

High tensile modulus and low breakage elongation combined with very good resistance to chemicals make it the right choice for different composite structural parts in various applications.

- High strength to weight ratio
- Low elongation to break
- Good heat & flame resistance
- Good chemical resistance
- High cut resistance
- Excellent ballistic properties

TYPICAL USES

Fiber properties: They are characterized by medium to ultra-high strength, medium to low elongation and moderately high to ultra-high modulus with the densities ranging from 1.38g/cm³ to 1.47g/cm³. Heat-resistant and flame-resistant aramid fibers contain high proportion or

meta-oriented phenylene rings, whereas ultra-high strength high-modulus fibers contain mainly para-oriented phenylene rings.

Chemical properties: All aramids contain amide links that are hydrophilic. However, not all aramid products absorb moisture the same. The PPD-T (poly-phenylene terephthalamide) fiber has very good resistance to many organic solvents and salt, but strong acids can cause substantial loss of strength. Aramid fibers are difficult to dye due to their high Tg. Also, the aromatic nature of para-aramid is responsible for oxidative reactions when exposed to UV light, that leads to a change in color and loss of some strength.

Thermal properties: Aramid fibers do not melt in the conventional sense but decompose simultaneously. They burn only with difficulty because of Limited Oxygen Index (LOI) values. It should be mentioned that at 300 degrees Celsius some aramid types can still retain about 50% of their strength. Aramids show high crystallinity which results in negligible shrinkage at high temperature.

Mechanical properties: Aramid yarn has a breaking tenacity of 3045 MPa, in other words more than 5 times than this of steel (under water, aramid is 4 times stronger) and twice than this of glass fiber or nylon. High strength is a result of its aromatic and amide group and high crystallinity.

Aramid retains strength and modulus at

temperatures as high as 300 degrees Celsius. It behaves elastically under tension. When it comes to severe bending, it shows non-linear plastic deformation. With tension fatigue, no failure is observed even at impressively high loads and cycle times. Creep strain for aramid is only 0.3%.

TECHNICAL DATA

	Unit	UAW™
Density	g/cm ³	1.44
Filament Diameter	μm	8.41
Thermal Conductivity	W/(m·K)	0.04
Tensile Strength	GPa	3
Tensile Modulus	GPa	112
Tensile Strain at Failure	%	2.4
Poisson's Ratio	-	0.36

STANDARD MODULUS

Property	unit	UAW™
Breaking Tenacity	MPa	3045
Specific Gravity Ratio	-	1.44
Elongation @ Break	%	3.5
Moisture Regain*	%	5
Creep**	%	0.03
Shrinkage***	%	0.02
Decomposition Temp	°C	425-480

* Equilibrium moisture regain @ 55% RH

** Creep @ 40%-58% ultimate tensile strength

*** Shrinkage in dry air @ 177 C for 30 minutes

To sum up, aramid general characteristics are:

- High strength
- Resistance to absorption
- Resistance to organic solvent, good chemical resistance
- No conductivity
- No melting point
- Low flammability
- Excellent heat, and cut resistance
- Sensitive to acids and ultraviolet radiation

INSTALLATION PROCEDURE

Installation of CTech-LLC® Unidirectional Aramid Wrap should be performed by licensed and specially trained groups of installers. The Installation must be compatible with existing relevant international codes. This section outlines the procedure to install CTech-LLC® Unidirectional Aramid Wrap UAW™.

PREPARATION OF SUBSTRATE

- All the surfaces must be cleaned from dirt, grime, dust, curing

compounds, oils, grease, waxes and all the other contaminated materials which may cause voids behind the CTech-LLC® composites.

- Repair mortar must be used to repair all the eroded or damaged concrete surfaces.
- An industrial vacuum cleaner must be used to remove dust and dirt.
- All the surfaces need grinding, Sandblasting, shot blasting, pressure wash or other common mechanical methods to reach an even concrete Substrate.
- The sharp edges must be smooth and rounded to a minimum radius of 25 mm.

APPLICATION

Aramid fiber applications are divided into two categories:

A) Reinforcement in composites like sport goods, aircraft, military vehicles and many other.

B) Fabrics in clothing such as fire protection clothes or bullet proof vests. More elaborative uses of aramid are:

- Various forms of composite materials
- Sail cloth
- Snowboards
- Protective gloves, helmets, body armor
- Filament wound pressure vessels
- Flame and cut resistant clothing
- Asbestos replacement
- Ropes and cables
- Optical fiber cable systems
- Jet engine enclosures
- Tennis strings and hockey sticks
- Wind instrument reeds
- Reinforcement for tires and rubber goods
- Circuit board reinforcement
- Coating
- Twisting
- Extrusion
- Pultrusion
- Precision Winding

Although every application meets its own requirements, almost all of them share aramid's major characteristics: high strength, high modulus, high toughness, thermal dimensionality stability, low creep and light weight.

STORAGE & SHELF LIFE

Aramid fibers should be stored at +10°C to +40°C and should not be exposed to direct sunlight. Keep the carbon fabrics in a dry place.

CAUTION

Use of chemical resistant gloves is recommended. Avoid breathing vapors and dust. Get medical attention if you are breathing with difficulty. Resins products can cause strong eye irritation. Avoiding eye contact and Using safety goggles is necessary.

CTech-LLC[®]

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IMPORTANT NOTE:

Before using any CTech-LLC[®] product, the user must review the most recent version of the product's technical data sheet, material safety data sheet and other applicable documents, available at www.ctech-llc.com.

WARANTY:

CTech-LLC[®] warrants its products to be free from manufacturing defects. Buyer determines suitability of product for use and assumes all risks. Buyer's sole remedy shall be limited to replacement of product. Any claim for breach of this warranty must be brought within one month of the 'date of purchase. CTech-LLC[®] shall not be liable for any consequential or special damages of any kind, resulting from any claim or breach of warranty, breach of contract, negligence or any legal theory. The Buyer, by accepting the products described herein, agrees to be responsible for thoroughly testing any application to determine its suitability before utilizing.
