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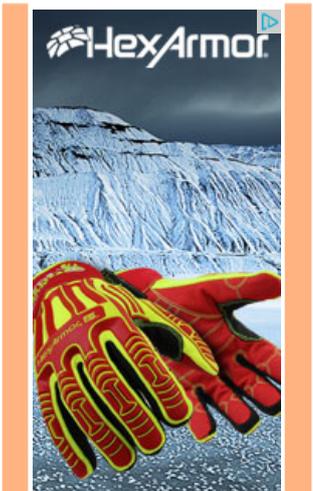
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Kevlar (aramid) fiber reinforced polymers

Dr. Dmitri Kopeliovich

Kevlar is the trade name (registered by DuPont Co.) of aramid (poly-para-phenylene terephthalamide) fibers.

Kevlar fibers were originally developed as a replacement of steel in automotive tires.

Distinctive features of Kevlar are high [impact resistance](#) and low density.

Kevlar fibers possess the following properties:

- High [tensile strength](#) (five times stronger per weight unite than steel);
- High [modulus of elasticity](#);
- Very low [elongation](#) up to breaking point;
- Low weight;
- High chemical inertness;
- Very low [coefficient of thermal expansion](#);
- High [Fracture Toughness](#) (impact resistance);
- High cut resistance;
- Textile processibility;
- Flame resistance.

The disadvantages of Kevlar are: ability to absorb moisture, difficulties in cutting, low compressive strength.

There are several modifications of Kevlar, developed for various applications:

- **Kevlar 29** – high strength (520000 psi/3600 MPa), low density (90 lb/ft³/1440 kg/m³) fibers used for manufacturing bullet-proof vests, composite armor reinforcement, helmets, ropes, cables, asbestos replacing parts.
- **Kevlar 49** – high modulus (19000 ksi/131 GPa), high strength (550000 psi/3800 MPa), low density (90 lb/ft³/1440 kg/m³) fibers used in aerospace, automotive and marine applications.
- **Kevlar 149** – ultra high modulus (27000 ksi/186 GPa), high strength (490000 psi/3400 MPa), low density (92 lb/ft³/1470 kg/m³) highly [crystalline](#) fibers used as [reinforcing dispersed phase](#) for composite aircraft components.

Kevlar filaments are produced by extrusion of the precursor through a spinneret. Extrusion imparts anisotropy (increased strength in the lengthwise direction) to the filaments.

Kevlar may protect [carbon fibers](#) and improve their properties: hybrid fabric (Kevlar + Carbon fibers) combines very high tensile strength with high impact and abrasion resistance.

The most popular matrix materials for manufacturing Kevlar (aramid) Fiber Reinforced Polymers are [Thermosets](#) such as [Epoxies \(EP\)](#), [Vinylester](#) and [Phenolics \(PF\)](#).

Kevlar Fiber Reinforced Polymers are manufactured by [open mold processes](#), [closed mold processes](#) and [Pultrusion](#) method.

Properties of some Kevlar (aramid) fiber reinforced polymers

([Materials Data](#))



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