A Method of Crosslinking and Tailoring Aramid or Poly-Amide Networks

Technology #5346

Fiber Composites

Composite materials made of strong fibers imbedded in plastics are growing in popularity, owing to their high strength and low weight. Composites using Aramid fibers (best known by their trade name Kevlar®) have found tremendous use across a range of industries from ballistics protection to aircraft to sporting goods. The challenge is that the materials often fail due to the inability of the plastic to transfer forces throughout the material. While composites are strong, a higher strength per weight is still desired. With a European Aramid fiber market of over $150M, growing at 7.8% CAGR and an aircraft exterior composites market growing at a CAGR of 12.3%, the market potential for a stronger, lighter fiber based composite is substantial.

Cross-linked Fibers

Researchers from the University of Michigan Mechanical and Chemical Engineering Departments have developed a technology that increases the strength Aramid fiber composites by crosslinking the fibers. The level of crosslinking is controlled by chemical treatments of the fibers, allowing for a very high strength material with customized properties. These high strength materials are then layered with very thin crack diffusing layers to increase the overall material toughness. Tests have been performed that verified increase in strength, stiffness, and toughness of the material over Kevlar® woven mat tested along its strongest axis. This increase in strength-to-weight ratio will prove highly beneficial in a multitude of applications.

Applications and Advantages

Applications

• Aerospace
• Sporting goods
• Wind Energy
• Automotive

Advantages

• Higher strength, stiffness, and toughness than Kevlar® woven mat
• Easily customizable properties

Inventors

Ellen M. Arruda