

High Strength and High Modulus Carbon Fibers

A method for producing high strength, high modulus, and high thermal stability carbon fiber using gel-spinning

Georgia Tech researchers have developed a method for creating high strength, high modulus, and high thermal stability carbon fiber from PAN using a gel-spinning technique. The gel-spinning process gives the fiber its high strength characteristics. The fiber is then drawn and stabilized to obtain the high elastic modulus and high thermal stability without ultra-high temperature heat treatment. The resulting elastic modulus is 25-30% higher and the thermal stability is 100 °C greater than that of current state-of-the-art fibers.

Summary Bullets

- **Lighter** – Carbon fiber is lighter than metals and exhibits significantly higher strength characteristics
- **Stronger and More Thermally Stable** – Process produces stronger fibers by using new processing techniques
- **Lower Energy Manufacturing** – Process does not require ultra-high temperature for heat treatment of fibers

Solution Advantages

- **Lighter** – Carbon fiber is lighter than metals and exhibits significantly higher strength characteristics
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Potential Commercial Applications

- Automobile and vehicle manufacturing
- Plane manufacturing
- Space craft manufacturing

Background and More Information

As industry tries to cut down weight of products and environmental impact of using metals, there is a shift to using carbon-based materials due to their lightweight and superb mechanical properties. Carbon fiber has low

weight and high strength characteristics, which makes it a desirable material for many applications that require weight savings but high strength. Common carbon fibers are produced using polyacrylonitrile (PAN) dry-jet wet spinning or wet spinning technologies to produce high strength carbon fiber. While PAN fibers with a high modulus of elasticity have been produced, it is at the expense of tensile strength. There is a market need to increase the tensile strength of these fibers along with their elastic modulus.

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Publications

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