Methods for Growth of Carbon Nanostructures on Carbon Fibers
Technology #15144

Applications

This invention has applications in the aerospace industry where it can be used to develop novel nanoengineered composite materials with superior mechanical, electrical, and thermal properties compared to existing composites.

Problem Addressed

Carbon fiber is often used in conjunction with resins to create composite materials with excellent tensile stiffness and strength in the plane of the reinforcing fiber plies. It has been suggested that circumferentially coating carbon fibers with arrays of aligned carbon nanotubes (CNTs) could enable through-thickness and interply reinforcement of carbon fiber-reinforced composites, thereby improving their mechanical properties along other directions. However, conventional methods of growing CNTs significantly degrade the tensile strength and stiffness of carbon fibers used as the substrate. This compromises the in-plane performance of the resulting composites. This invention describes a novel method of growing CNTs on carbon fibers while retaining desirable base fiber properties.

Technology

Aligned CNTs can be grown circumferentially around carbon fibers using a variety of CVD processes, many of which take place at elevated temperatures. When carbon fiber is heated above a certain threshold temperature, it experiences a significant loss of both tensile strength and stiffness. The Inventors have demonstrated that tensioning the fibers to approximately 12% of mean breaking strength during the heating process results in the preservation of both stiffness and strength.

Advantages

- CNT-coated carbon fibers enable through-thickness and interply matrix reinforcement of composites
- CNT growth process maintains stiffness and strength of substrate fiber

Categories For This Invention:

Materials
Micro & Nanotech
Nanomaterials

Intellectual Property:
Systems and methods for growth of nanostructures on substrates, including substrates comprising fibers
Issued US Patent 9,540,243
Systems and methods for growth of nanostructures on substrates, including substrates comprising fibers
Issued US Patent

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