

Microporous Carbon Nanofibers

Technology #20186

Applications

This carbon nanotube technology has applications in lithium battery manufacturing and toxin remediation.

Problem Addressed

Carbon nanofibers are nanometer diameter filaments formed from graphene. Carbon nanofibers have tunable properties that can be adapted for use in lithium batteries, medical therapeutics, or environmental toxin remediation. Current methods to manufacture carbon nanofibers require specialized equipment and frequently result in inconsistent fiber sizes. This technology is a novel synthesis method for carbon nanotubes that results in self-assembly of precisely uniform nanotubes.

Technology

This technology uses M13 bacteriophage to serve as a template for carbon nanofiber synthesis. The inventors engineered a M13 capsid protein to serve as a template for nanofiber self-assembly. The two-step nanofiber synthesis begins by using M13 phage to nucleate formation of resorcinol-formaldehyde (RF) nanofibers. In the second step, the RF nanofibers are carbonized to yield carbon nanofibers with uniform shape and a very small diameter. Importantly, both the nanofiber morphology and surface nanotexture can be tuned by altering the M13 nucleation moiety or the composition of the RF mixture, respectively. The inventors demonstrate that these microporous carbon nanofibers can be used as an interlayer in lithium-sulfur batteries to greatly increase the discharge capacity and retain capacity after repeated cycling. Additionally, these carbon nanofibers show promise as a therapeutic treatment of toxin exposure, and proof of concept experiments demonstrate these nanofibers are superior to activated carbon in adsorbing toxins.

Advantages

- Highly uniform microporous carbon nanotubes
- Precise control over nanofiber diameter and nanotexture
- Scalable reaction conditions

Categories For This Invention:

Energy

Energy Storage

Batteries

Lithium Batteries

Materials

Micro & Nanotech

Nanomaterials

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Polymers (Materials)
Life Sciences
Clinical Applications
Environment

Intellectual Property:

Microporous carbon nanofibers
Provisional

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