Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

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Inventors

Bin Mu

Mitchell Armstrong

Contact

Shen Yan
shen.yan@skysonginnovations.com

Electrospun Nanoparticle Nanofiber Composites As New Porous Materials with Improved Selectivity and Stability

Electrospun Nanoparticle Nanofiber Composites: Porous, Selective, and Stable

Background

The field of absorption technology spans from the absorption of gas to the absorption of contaminants. However, current absorbing materials are not particularly selective or stable. For an absorbing material to be effective it must minimize the uptake of undesirable gases and be packable. Some promising materials such as metal-organic frameworks, zeolites, activated carbon, metal oxides, do not typically satisfy these conditions. However, a composite material, electrospun fibers coating on porous particles, has the potential to overcome these challenges. These fibers are appealing for their combination of a single macroscopic dimension and two nanoscopic dimensions, which allows them to be handled and still have large surface area to volume ratios.

Invention Description

Researchers at ASU have developed an apparatus and method to form core-shell electrospun fiber composites. This invention provides a new strategy to improve the selectivity, stability, and packing methods of adsorbent materials by electrospinning a polymer nanolayer over porous particles for the first time. Electrospinning provides a fast, cost-effective, and easily scale-up approach to fabricate nanoparticle nanofiber composites. The core-shell composites have improved absorption selectivity, are stable in aqueous conditions, and are packable. The composites are designed such that the desirable sorbate reaches the core in a reasonable time. The method maybe used to improve the performance of porous materials in the fields of adsorption, separation, storage, and catalysis.

Potential Applications

- Adsorption
- Separation
- Storage
- Catalysis

Benefits and Advantages

- Adaptable- This technology can utilize a variety of different polymers as well as MOF’s to address a variety of situations.

Professor Mu's Website

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