Nanocellulose-based Aerogel Fibers as Insulation

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ABSTRACT

Researchers at the University of California, Davis have produced continuous, sheath-core, coaxial fibers with highly porous, nanocellulose, aerogel cores for use as high-performance insulators.

FULL DESCRIPTION

Aerogels are high-porosity, ultralight, materials that are 99+% air. Their properties include uncommon traits that allow aerogels to fulfill unique applications. For example, incorporating three-dimensional (3-D) aerogels into fibers produces clothing with properties that include protection against both extreme hot and cold. Currently, such aerogel fibers are produced using both dissolution and coagulation processes. However, dissolution and coagulation are time-consuming and chemically-intensive. Moreover, current aerogel fabrication processes struggle to produce continuous fibers consistently while also maintaining aerogel-like density and porosity. Thus, there is a need for an improved process that can create continuous, aerogel-like, fibers.

Researchers at the University of California, Davis have developed a method for producing continuous fibers with highly porous aerogel cores. This technology combines cellulose - which is among the least thermally conductive materials - with highly porous aerogel structures in order to maximize the thermal insulation potential of the fibers. Moreover, the sheath component functions as a template and as a surface layer to protect the integrity of the aerogel structure from external forces or the environment. Thus, this method yields continuous fibers while maintaining internal aerogel structures. These fibers can potentially be used for various insulation devices, wearables, and other platform technologies with multiple, commercial scale, applications.

APPLICATIONS

- Widespread thermal protection and insulation material applications

FEATURES/BENEFITS

- Provides thermal insulation in ambient temperatures ranging from -20 to 150°C
- Produces fibers strong enough for weaving, knitting, and other textile applications
- Can create fibers of variable diameters
- Is scalable
- Applicable to various, energy-saving, solutions

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20210156051	05/27/2021	2020-030

CONTACT

Amir J. Kallas
ajkallas@ucdavis.edu
tel: .

INVENTORS

- Hsieh, You-Lo
- Zhou, Jian

OTHER INFORMATION

KEYWORDS

Nanocellulose, Aerogel, Insulation, High porosity, Fiber, Thermal conductivity, Clothing technologies, Energy-efficient

CATEGORIZED AS

- **Energy**
  - Other
- **Materials & Chemicals**
  - Nanomaterials
  - Textiles
- **Nanotechnology**
  - Materials
  - NanoBio
- **Engineering**
  - Other

RELATED CASES

2020-030-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Ultra Light Amphiphilic and Resilient Nanocellulose Aerogels and Foams
- Conductive and Elastic Nanocellulose Aerogels
- Nanocellulose-Assisted Exfoliation of Graphite to Few Layer Graphene
- Method for Producing Amphiphilic and Amphoteric Soy Protein Colloids, Sub-Micron Fibers, and Microfibrils

University of California, Davis
Technology Transfer Office
1 Shields Avenue, Mrak Hall 4th Floor,
Davis,CA 95616

Tel:
530.754.8649
techtransfer@ucdavis.edu
https://research.ucdavis.edu/technology-transfer/
Fax:
530.754.7620