Conductive and Elastic Nanocellulose Aerogels

Tech ID: 29536 / UC Case 2018-809-0

ABSTRACT

Researchers at the University of California, Davis have developed conductive nanocellulose aerogels as building blocks for mechanical strain sensors and coaxial aerogel fibers for cryo- and thermo-protective insulation.

FULL DESCRIPTION

Nanocellulose aerogels are ultra-light porous materials used for a wide variety of applications including insulation, packaging, filtration, ion diffusion and drug delivery. Aerogels containing electrically conductive polymers have shown promise in applications such as strain sensing due to their compressive flexibilities and electrically conductive nature. The challenge, however, lies in the interface between the non-conductive and low dry compressive strength of the cellulose aerogel and the conductive polymer.

Researchers at the University of California, Davis have developed conductive nanocellulose aerogels with higher dry tensile strength and modulus than current aerogels to be handled and used as stand-alone materials. The composite aerogel contains cellulose nanofibrils (CNF) protonated with conductive polymer, infused with an elastomer to be flexible, stretchable, conformable to shapes and motions as highly sensitive and linearly responsive strain sensors.

In parallel, the researchers have also developed a coaxial structured microfiber containing nanocellulose aerogel core and cellulose ester sheath. The hierarchical pore structures in the core and the sheath combine the unique characteristics of low thermal conductivity, good mechanical strength, and low mass density to be highly insulating for applications in cryo- and thermo-protective wearables, deformables, portables as well as in space and large-scale structural applications. These novel fibers are renewable, biodegradable and producible in existing wet-spinning facilities to be scalable and cost effective.

APPLICATIONS

- Conductive nanocellulose aerogels for mechanical strain sensors
- Continuous coaxial aerogel fibers for cryo- and thermo-protective insulation

FEATURES/BENEFITS

- High mechanical strength
- Ultra-low mass density
- Super-light
- Biodegradable
- Cost-effective
- Tunable and linearly responsive

PATENT STATUS

Country	Type	Number	Dated	Case

CONTACT

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

INVENTORS

- Hsieh, You-Lo
- Zhou, Jian

OTHER INFORMATION

KEYWORDS

cellulose nanofibrils, CNF, aerogel, strain sensor, sensitivity, elastic, aerogel fiber, coaxial fiber, insulator, conductive, cryoprotective, thermoprotective, insulation, wearables

CATEGORIZED AS

- **Materials & Chemicals**
  - Composites
  - Nanomaterials
  - Other
  - Polymers
- **Nanotechnology**

United States Of America	Issued Patent	11,549,854	01/10/2023	2018-809	

Additional Patent Pending

- Materials
- **Sensors & Instrumentation**
- Other

RELATED CASES

2018-809-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Ultra Light Amphiphilic and Resilient Nanocellulose Aerogels and Foams
- Nanocellulose-Assisted Exfoliation of Graphite to Few Layer Graphene
- Nanocellulose-based Aerogel Fibers as Insulation
- 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