

Ultra Light Amphiphilic and Resilient Nanocellulose Aerogels and Foams

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ABSTRACT

Researchers at the University of California, Davis have developed an energy efficient method of producing ultra-light aerogels with excellent dry compressive strength and tunable hydrophobicity by ambient drying of nanocellulose wet gels.

FULL DESCRIPTION

Aerogels are ultra-light porous materials that are uniquely desirable for a wide variety of applications including insulation, packaging, filtration, ion diffusion and drug delivery. However, commonly used processes such as supercritical drying of silica aerogels, or freezing and freeze-drying of natural and synthetic polymer-based aerogels consume immense energy.

Researchers at the University of California, Davis have developed a facile and more energy efficient process to produce ultra-light nanocellulose aerogels with improved mechanical strength and hydrophobicity. This process enables drying under ambient conditions, and therefore does not require any high vacuum, freeze drying or heating steps. This process is not only more energy efficient and economic, but also feasible for scaling up. Chemical crosslinking results in aerogels that have an even higher specific surface area, dry compressive strength, and tunable hydrophobicity. Unlike hydrophilic silicon aerogels or hydrophobic carbon nanotube or graphene based aerogels, these nanocellulose based aerogels are amphiphilic super-absorbents and tunable to become hydrophobic super-absorbents. These nanocellulose based aerogels are derived from sustainably sourced feedstock, i.e., waste streams of agriculture and food and beverage processing: the process turns under-utilized byproducts into high value added products and helps to reduce environmental impact of our food production system.

APPLICATIONS

- ▶ Oil-water separation
- ▶ Wastewater treatment
- ▶ Super light waterproof and water propellant materials or coating
- ▶ Differential removal or recovery of organics and heavy metals
- ▶ Cell and tissue scaffolds
- ▶ Growth media
- ▶ Super absorbent wound dressing and biomedical materials
- ▶ Defense and aerospace appliances
- ▶ Super light thermal and acoustic insulation
- ▶ Super light elastomer

FEATURES/BENEFITS

- ▶ Drying under ambient pressure and temperature without structure deformation
- ▶ Shorter drying time and less energy consumption with high efficiency

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INVENTORS

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OTHER INFORMATION

KEYWORDS

nanocellulose, aerogel, super-light, super-absorbent, hydrophobic, filtration, insulation, ambient drying, cross-linking, cellulose derivatives, biomaterials

CATEGORIZED AS

- ▶ **Materials & Chemicals**
 - ▶ Biological
 - ▶ Nanomaterials
- ▶ **Nanotechnology**
 - ▶ Materials
 - ▶ NanoBio
 - ▶ Other

RELATED CASES

- ▶ Enhanced dry compressive strength
- ▶ Tunable hydrophobicity
- ▶ Improved thermal stability
- ▶ Higher specific surface
- ▶ Solely bio-based products
- ▶ Conversion of food/beverage/agricultural waste

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PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,269,935	04/08/2025	2016-909
United States Of America	Issued Patent	11,248,107	02/15/2022	2016-909

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Conductive and Elastic Nanocellulose Aerogels](#)
- ▶ [Nanocellulose-Assisted Exfoliation of Graphite to Few Layer Graphene](#)
- ▶ [Direct Production of Sulfated Cellulose Nanofibrils](#)
- ▶ [Nanocellulose-based Aerogel Fibers as Insulation](#)
- ▶ [Compositions and Methods Related Functionalized Cellulose Nanofibrils](#)
- ▶ [Method for Producing Amphiphilic and Amphoteric Soy Protein Colloids, Sub-Micron Fibers, and Microfibrils](#)

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