SYNTHESIS OF CELLULOSE AEROGEL AND THEIR APPLICATION IN THE FIBROUS STRUCTURES

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Abstract: Aerogels stand out as captivating substances of the twenty-first century, owing to their distinct structure. Praised for their exceptional mechanical properties and remarkably low weight, they have garnered recognition as "miracle materials". These aerogels have piqued the interest of researchers across various sectors due to their remarkable resilience in harsh working conditions. Cellulose aerogels inherit cellulose's renewability, biocompatibility, and biodegradability, along with additional benefits such as low density, heightened porosity, and an extensive specific surface area, positioning them as materials with immense potential in this era. With superior compressive strength and superior biodegradability, cellulose aerogels emerge as eco-friendly and versatile modern materials offering significant opportunities for applications ranging from thermal insulation to flame retardancy and various other multifunctionality. This study delves into the materials utilized in producing various types of cellulose-based aerogels, exploring their characteristics, analytical methodologies, and their multifunctionality in textiles. Within the textiles sector, a comprehensive discussion is presented on diverse techniques for achieving multifunctionality with cellulose-based aerogels, accompanied by thorough analyses.

Keywords: *cellulose aerogel, multifunctionality, synthesis, fiber structure.*

Table 1 The characteristics of cellulose-based aerogels.

Aerogel Type	*Main Properties*	*Distinctive Features*	*Application*
Bio-based aerogel from Sodium alginate and chitosan	Eco-friendly and sustainable, excellent thermal insulation, bio-based flame retardant	0.06–0.1 W/mK low thermal conductivity,11.3 kW/m^2 radian heat exposure	Anti-flame apparel
Holocellulose nanofibril (HCNF) aerogel from bamboo pulp and birch	Fiber forms Self-cleaning Capabilities Washability Outstanding thermal	413 m^2/g specific surface area, up to 190 ◦C thermal insulation 85% porosity	Thermal management and EMI shielding performance
wood blocks	insulation performance	20.8 MPa high strength	

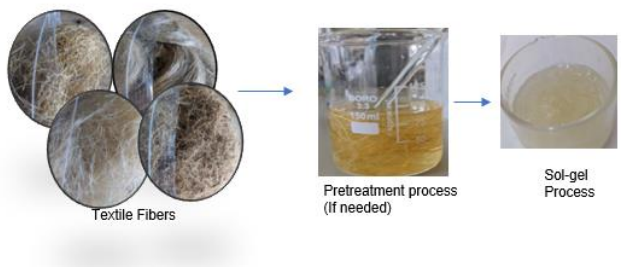

Figure 1 Preparation of Cellulose aerogel

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