Aerogel-like cellulose made without low- or high-pressure technology

Lucile Druel and Tatiana Budtova*[1]

[1]Centre de Mise en Forme des Matériaux – Mines Paris - PSL (École nationale supérieure des mines de Paris), Centre National de la Recherche Scientifique – France

Résumé

Bio-based aerogels are nanostructured materials with low density and high specific surface area of several hundreds of m2/g. To obtain such properties, the solvent from aerogel precursor is usually extracted under supercritical conditions. The reason is that capillary pressure, which is developed during drying at ambient pressure, is zero in supercritical conditions and pores' collapse is avoided. However, supercritical drying is costly and involves high-pressure technology; thus the development of alternative drying pathways, still preserving aerogel precursor morphology, are of a great interest. One option is to perform evaporation of a non-polar liquid from the pores of aerogel precursor; capillary pressure, which is directly proportional to the surface tension between the evaporating liquid and gas phases, should be as low as possible.

We prepared cellulose II aerogel-like materials using low-vacuum drying from ethanol /1/. The density of the materials was around 0.1 – 0.2 g/cm3 and specific surface area 200 – 300 m2/g, very similar to characteristics of cellulose II aerogels obtained via drying with supercritical CO2. The influence of processing conditions on material morphology and properties will be discussed together with intriguing open questions.

1. L. DRUEL, T. BUDTOVA, "Aerogel-like (low density and high surface area) cellulose monoliths and beads obtained without supercritical- or freeze-drying", *Cellulose*, **30**, 8339–8353 (2023), https://doi.org/10.1007/s10570-023-05349-8

*Intervenant