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Upscaling of Cellulose Aerogel Sheets from Hemp Fibers

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The aim of this work was to produce cellulose aerogel sheets from hemp-extracted cellulose by using the CaProLi® (**C**ellulose **A**erogel **P**roduction **L**ine) as an up-scaling device. Cellulose aerogel sheets have the potential to be used as a sustainable thermal insulation material [1]. Furthermore, they can be used as a material for wound dressing and healing [2]. Two different commercial celluloses were used as references, and compared with the samples prepared from hemp fibers. In addition, they were used to investigate a useful viscosity range for the upscaling process. Suitable recipes were prepared by the addition of sodium salts. Cellulose was dissolved in a mixture of water, NaOH and urea. The samples were dried supercritically with CO_2, after neutralization and solvent exchange to ethanol. The aerogels were characterized for their porosity, morphology and internal structure (BET, SEM, total pore volume and pore size distribution). Additionally, the influence was investigated of the sodium salt addition on the gelation time. The cellulose extracted from the hemp presented good quality, and the hemp cellulose aerogels showed the lowest envelope density and therefore the highest porosity of all the cellulose aerogels. The nitrogen adsorption-desorption analyses showed BET surface area values in the range of 194-288 m^2/g. The effects on the reduction of the gel point in the cellulose solution were also observed with the addition of sodium

salts. A continuous production process of cellulose gel sheets was established (conveyer belt speed of 0.56 cm/s) which is an important step in the up-scaling of this technology.

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