

Design and mechanical properties of ultra light-weight nanocellulose foams

Background

In the context of a sustainable society, there is strong motivation to replace petroleum-based polymers with polymers from renewable resources. Cellulose has a special potential as one of the most abundant renewable natural polymers, widely used in industry. The term "nanocellulose" refers to cellulosic nanofibrils disintegrated from the plant cell walls. New methods for the manufacture of very small and homogeneous nanocellulose have recently been developed at Innventia AB. The nanocellulose fibers are 5 - 20 nm thick and have a length of up to several μm . There is currently an emergent interest in using wood fibers, especially nanocellulose, as a load bearing constituent in composite materials. It's also desirable to develop light-weight cellular biocomposites; foams, based on this renewable resource, for application in the field of packaging and insulation materials. Furthermore, porous foams with nano- and micro-sized pores made from natural polymers are of special interest for medical, cosmetic, pharmaceutical, and other applications where biocompatibility and biodegradability are required.

Project description

The aim of this project is to develop ultra light-weight nanocellulose foams. Different processing parameters, such as concentration of nanocellulose, freeze-drying processes and the surface chemistry of nanocellulose, will be varied to control the pore sizes, surface texture and the density of the foams. The microstructure and mechanical properties will be experimentally determined.

Prerequisites

The candidate should preferably be a last-year student in a suitable M.Sc. program in chemistry, biotechnology, chemical engineering, mechanical engineering etc.

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