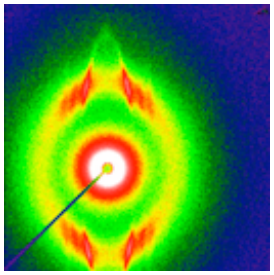

Contribution ID : **21** Type : **not specified**

Contr. Talk 10 - Orientation distribution of cellulose nanofibrils and nanocrystals in channel flow

Tuesday, 11 December 2018 15:30 (20)

Nature has a remarkable way of creating complex hierarchical nanostructures of cellulose nanofibrils (CNF) into various forms of trees and plants. Depending on local environment, evolution has tailored these structures over millions of years to enhance the particular species' chances of survival. Learning from nature, we explore the possibility to tailor the properties of cellulose materials materials to suit our needs by hydrodynamically aligning the CNF and assembling them through controlled gelation and subsequent drying. The orientation distribution of CNF will depend on various parameters including flow properties such as deformation state (e.g. shear and extension) and flow rates as well as CNF properties such as fibril length distribution and concentration. In this work, we study the orientation of CNF and cellulose nanocrystals (CNC) in the shear layers of a channel flow using small angle X-ray scattering. The results are compared with simulations of dilute anisotropic Brownian particles. Furthermore, we demonstrate how polarized microscopy can be used to estimate the orientation distribution of these birefringent dispersions in the channel as well as determine their rotary diffusion rates. The results greatly enhance our understanding of CNF dynamics in flows, which in turn can lead to new strategies in controlling the structure of nanofibrous materials.

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Session Classification : Later afternoon session - Associated systems