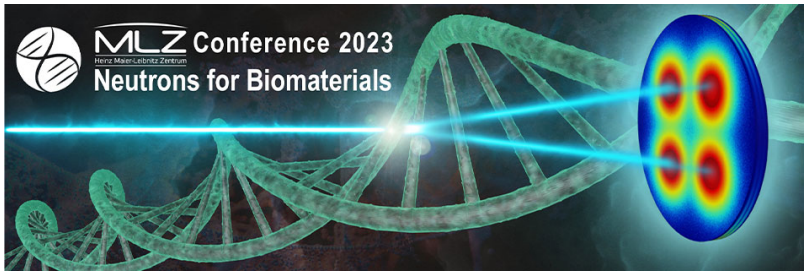

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Sustainable cellulose nanofibril-based multifunctional templates

Tuesday, 23 May 2023 17:00 (20 minutes)

Cellulose nanofibrils (CNF) are derived from wood and thus renewable biomaterials par excellence. There nanoscale diameter, high aspect ratio, mechanical strength, and flexibility make them ideally suited as nanoscale building blocks for replacing synthetic nanocomposite materials, membranes, and templates for organic electronics and photovoltaics. Being dispersed in water, CNF dispersions facilitate green chemistry approaches; spray deposition allows for facilitating ultra-smooth, scalable, and nanoporous thin CNF films as advanced templates for hybrid materials. They find application in biosensors, electrodes, and soft robotics. In view of circular bioeconomy, the recycling capacity of such templates is vital, and thus it is mandatory to understand their interaction with water. We hence apply grazing incidence small-angle neutron scattering (GISANS) and neutron reflectometry (NR) to investigate in situ their behaviour, such as swelling and nanoscale rearrangement, under humid environment. Our results show a remarkable structural reversibility of hybrid thin films. Applying functional layers, such as advanced green-chemistry colloids inks for optoelectronic applications, often necessitates the application of water-based dispersions on the CNF templates. Here, time-of-flight GISANS is used to elucidate the potential imbibition of the functional materials into the template and the accompanying nanostructural changes in the nanoporous CNF templates due to the interaction with water.

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