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Partially Oxidised Cellulose Nanofibril Gels for Rheology Modification

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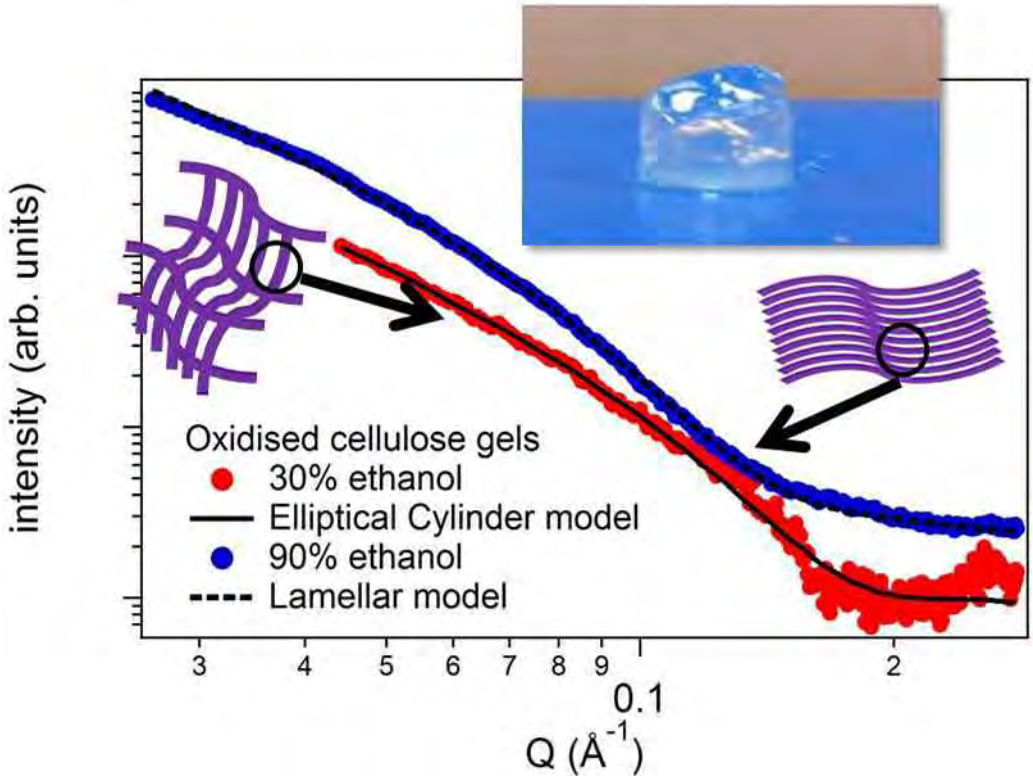
Partially C6-oxidised cellulose nanofibrils form a transparent, slightly viscous suspension in water. These materials, sourced from soft-wood waste, have shown excellent potential for use as a rheology modifier in aqueous formulations, when mixed with salt and minimal amounts of anionic surfactants [1] or with short chain alcohols. The interaction with anionic surfactants is particularly surprising as the cellulose fibrils themselves carry a net negative charge. The gels formed are transparent, mild on the skin and have excellent suspending properties while also being strongly shear thinning making application eg via spraying possible. The partially oxidised cellulose nanofibrils can also be used to stabilize oil-in-water Pickering emulsions. Both the gels and emulsions are of interest for use in personal care products such as creams, sanitizers and shower gels. We have probed the micelle-fibril interactions in water and in the presence of ethanol using contrast matching SANS on the gels and also on the cellulose-stabilized Pickering emulsion droplets. SAXS has also been used to probe the effect of short chain alcohols on the nanofibril structures in the gels as a function of alcohol chain length, while neutron reflectivity was used to probe surfactant-fibril binding for anionic and nonionic surfactants in thin nanofibril layers. The nanostructures formed in suspensions of partially oxidised cellulose nanofibrils with a range of salts, alcohols and surfactants will be correlated with their rheological behaviour. These factors will be discussed and brought together to give insights into how and why these systems form gels.

[1] *R. Crawford, K.J. Edler, S. Lindhoud, et al., Green Chemistry (2012) 14, 300-303 doi:10.1039/C2GC16302K*



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