Electronic Supplementary Material (ESI) for Soft Matter.
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Electronic Supplementary Information (ESI)

for

Rheology and microstructure of concentrated Microcrystalline cellulose (MCC)/1-allyl-3-methylimidazolium chloride (AmimCl)/water mixtures

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Analysis of shear banding in MCC/AmimCl solutions[1]:

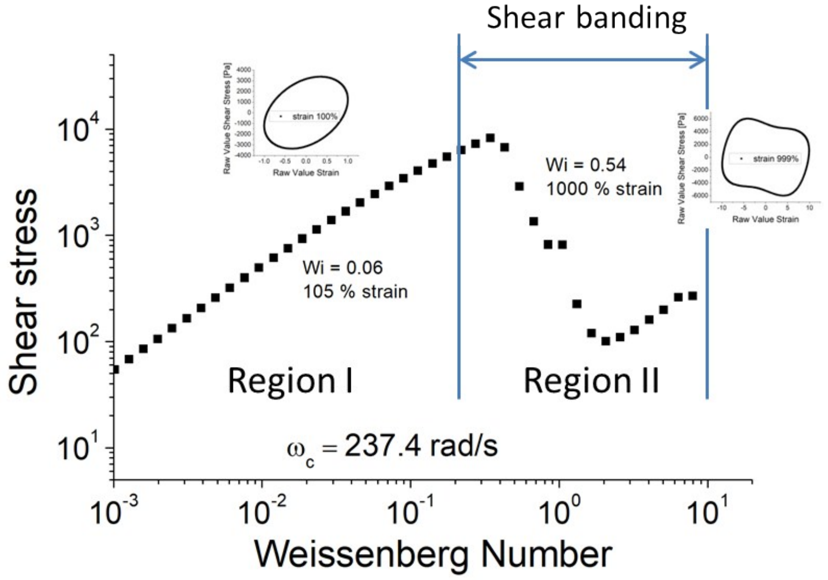

Figure S 1 Shear stress Vs Weissenberg number ($\dot{\gamma}\lambda, \gamma_0\omega\lambda$) for 15 wt% MCC/AmimCl solution with 1.44 wt% water.

Gurnon *et al.* established an experimental methodology for analysing the shear banding phenomena in polymer-like micellar solutions connecting Rheo-SANS and non-linear rheology.[1] This analysis includes the use of steady shear and dynamic oscillatory shear rheology to obtain a plot of shear stress versus Weissenberg number ($\dot{\gamma}\lambda$), similar to the plot shown in Figure S1. Here, λ is the relaxation time, which can be identified from the cross over frequency (ω_c) identified from frequency sweep and $\dot{\gamma}$ is the shear rate from steady shear data. The insets in Figure S1 show Lissajous curves with signatures of shear banding. Three regions can be identified from this graph as: region I corresponds to the entangled flow, where there is a monotonous increase in shear stress, region II with non-monotonous changes in shear stress which is evident for shear banded flow. Region III corresponding to unentangled flow at very high shear rates, as mentioned in Gurnon *et al.*[1] could not be identified as such high shear rates cannot be reached in the rheometer used. The Lissajous curves at different strain (γ_o) corresponding to a particular Weissenberg number ($\gamma_o\omega\lambda$) is identified from the strain sweep waveform data. The Lissajous curves corresponding to region II show the signature stress overshoot near zero strain, representing shear banding.

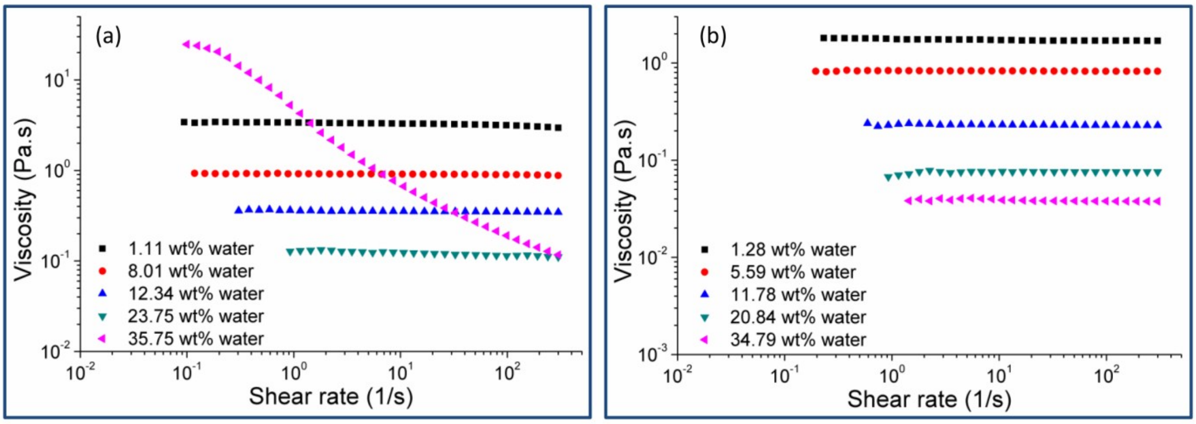

Figure S 2 Steady shear viscosity of **(a)** 0.5 wt% of MCC/ AmimCl and **(b)** binary mixture of AmimCl/water as a function of shear rate at different water concentrations as shown in the legend.

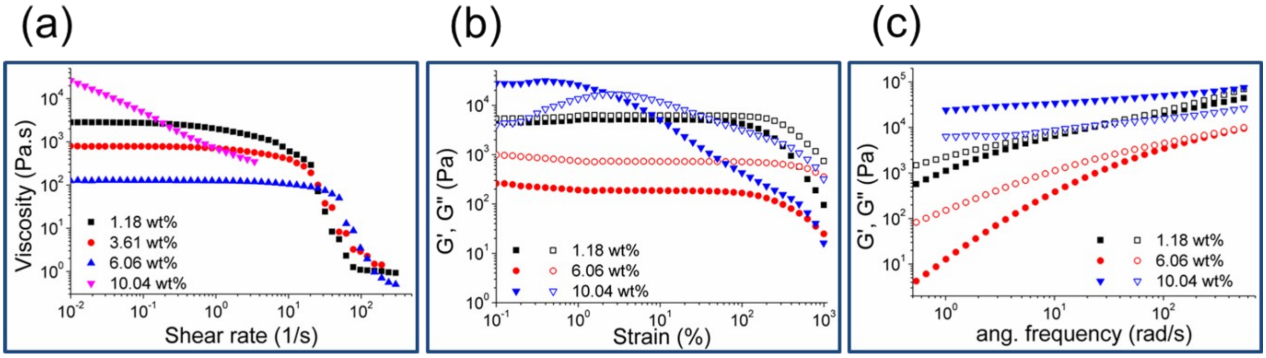

Figure S 3 Rheological response of 10% MCC/BmimCl solution. (a) steady shear viscosity as a function of shear rate, (b) strain sweeps at 6.28 rad/s angular frequency and (c) small amplitude frequency sweep responses. The respective water concentrations are shown in the legend.

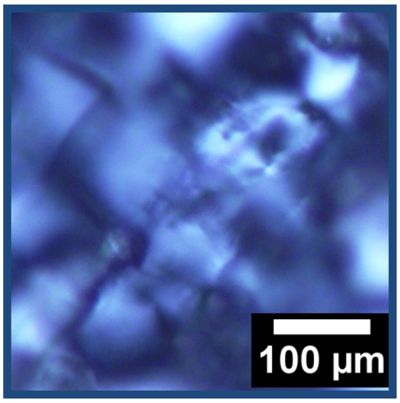

Figure S 4 Polarization optical microscopy image of 10% MCC/BmimCl solution at 10.04 wt% water concentration, showing liquid crystalline domains.

Reference:

[1] A. K. Gurnon, C. R. Lopez-Barron, A. P. Eberle, L. Porcar and N. J. Wagner, *Soft Matter*, 2014, **10**, 2889–2898.