Cellulose is the World's most abundant biopolymer and hence an important renewable raw material for many materials. It is (semi-)crystalline with a high melting point, and decomposes far before melting can be reached. Processing of cellulose thus require dissolution of the cellulose pulp. But, dissolving cellulose has turned out to be a challenge. Cellulose happens to be fascinatingly insoluble in all classical polar and non-polar solvents, because of its stable crystalline state. Solubility may, however, be obtained for example in certain ionic liquids and also (partly) in a strong base, the latter being the basis for the production of viscose fabrics. There are two major polymorphs of cellulose, native (wood) Cellulose I and the more stable Cellulose II. Dissolving pulp (Cellulose I) therefore may result in a supersaturated solution with respect to Cellulose II, and the association of cellulose in solution. It this talk we will discuss cellulose dissolution and association in solution, with the potential application of textile fiber spinning.

Figure 1 – (Left) Small angle X-ray scattering patterns, normalized by the concentration, obtained from cellulose dissolved in 40 wt.% (1.3 M) tetrabutyl ammonium hydroxide(aq) in the concentration range 0.02 to 0.10 g/cm³. (Right) Illustrating the association of cellulose in solution, as precipitation of Cellulose II, and the potential percolation and gelation.