**PEPTIDE HYDROGELS FROM TWISTED RIBBON AGGREGATES**

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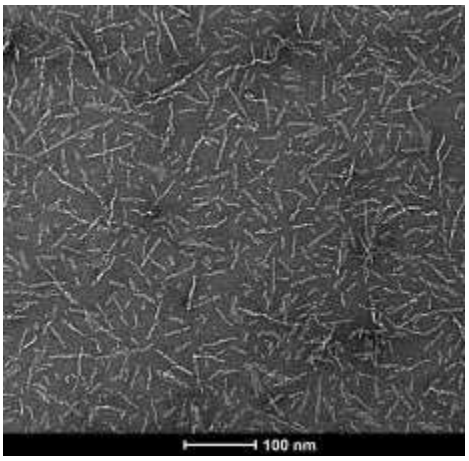
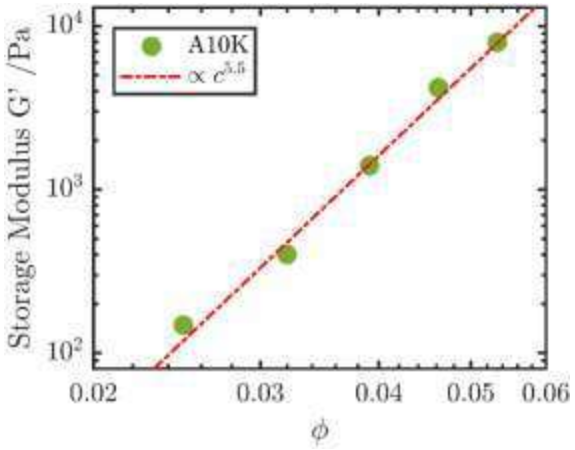
We have studied the rheology of an aqueous solution phase formed in the model peptide system $A_{10}K$ (A=alanine, K=lysine), where the short hydrophobic peptides self-assemble into twisted ribbon structures consisting of laminated beta-sheets. The ribbons are crystalline in 2 dimensions, therefore rigid, and they are weakly charged. The average ribbon lengths, $\langle L \rangle \approx 60$ nm, corresponding to an aspect ratio, $L/d \approx 10$. With increasing concentration a transition from a viscous liquid into a gel-like solid occurs around a volume fraction $f \approx 0.02$, that we identify as the overlap concentration $f^*$. Coinciding with the overlap concentration is also a phase transition, from the low concentration isotropic liquid phase to a nematic phase. This concentration is significantly lower than what is predicted for hard rods by Onsager theory for this given aspect ratio. We attribute this to the ribbon charge and long range electrostatic interactions, stabilizing the nematic phase. In this nematic phase, the storage modulus $G'$ increases strongly with increasing $f$.




***a)***




***b)***

*Figure 1- a) Negatively stained TEM image of $A_{10}K$ twisted ribbons. The average length $\langle L \rangle \approx 60$ nm, with a significant polydispersity. b) The storage modulus, G', at a constant strain, γ=1%, as a function of volume fraction above f*, where the dashed line is a guide to the eye.*