VISCOELASTIC PROPERTIES AND STRUCTURE OF DUAL NETWORKS OF POLYMER AND MICELLAR CHAINS.

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Viscoelastic properties of wormlike micelles (WLMs) can be enhanced by mixing them with polymeric chains. Nowadays, the study of double networks based on polymers and surfactants are widely studied in order to increase the mechanical properties of the system compared to the mechanical properties of the components separately. Therefore, different ways of increasing the mechanical properties of wormlike micellar solutions are proposed. One approach is based on mixing wormlike micelles with polymer molecules [1]. In order to increase viscoelasticity, the addition of polymer should not result in the disruption of wormlike micelles, which may happen, for instance, in the case of weakly hydrophobic polymers.

In this work, we studied systems prepared by mixing WLMs of surfactants with polysaccharide chains of hydroxypropyl guar with molar mass 1,600,000 g/mol. The WLMs were composed of two surfactants with opposite charge. It was shown that this system is homogeneous over a wide range of concentrations of both components. It also was shown that the system is reached microphase separation with the formation of two parts: the first is polymer rich and the second surfactant rich. Also it was found that at a wide range of surfactants concentrations and constant HPG concentration scattering curves can be well fitted by a form-factor of cylinder, that means that HPG does not affect wormlike micelles structure.

At this work the rheological properties of mixed structures were observed. It was found that the rheological properties of individual components were lower than the same properties of dual networks. The viscosity of mixed structure is 180 times higher in comparison with the separate components. This synergetic effect of properties can be described by formation polymer-rich and surfactant-rich areas and lack of electrostatic interactions between components, which leads to an increase in the number of the increase of intermicellar and interpolymer entanglements. This synergetic effect of rheological properties can be widely used at different applications: for example, commercial hydraulic fracturing fluids.

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