STUDY OF THE EFFECT OF A WATER-SOLUBLE MONOMER ON MICELLES OF SURFACTANTS FOR MICELLAR POLYMERIZATION PROBLEMS

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Recently, the study of wormlike micelles of surfactants has attracted much attention due to their remarkable rheological properties. Supramolecular surfactant chains are highly sensitive to external factors due to the nature of non-covalent interactions that bind molecules together within a micelle. However, the reaction of worm-like micelles to non-polar substances, for example, hydrophobic water-insoluble monomers, has been studied so far. The influence of water-soluble monomers has been studied in much less detail. At the same time, studying the interaction of vinyl monomers with worm-like micelles is an equally important issue for creating networks of hydrophobically modified polymers by emulsion copolymerization.

In this work, we studied the effect of a water-soluble monomer, acrylamide, on micelles of a worm-like surfactant for the purpose of further polymerization and the preparation of polyacrylamide/surfactant networks. It was found that acrylamide has a different effect on linear and branched micelles: for linear micelles (at low salt concentrations), the viscosity immediately decreases, and for branched micelles (at high salt concentrations), it first increases and then decreases. It has been shown by small-angle neutron scattering that linear cylindrical micelles are transformed into spherical micelles, and branched micelles are transformed into short cylindrical micelles. This difference in the behavior of linear and branched micelles is associated with different packing of surfactant molecules due to shielding of electrostatic interactions with changing salt concentration. It has been shown by fluorescence spectroscopy that some of the acrylamide molecules are incorporated into micelles, which causes changes in their structure. Using computer modeling, it was found that only a part of acrylamide molecules interact with micelles, while most of them are in aqueous solution and do not penetrate into micelles. The characteristic size of micelles at a high monomer concentration was determined.

Thus, it has been shown that acrylamide causes the destruction of the network of long micelles and their transformation into much smaller aggregates. This is caused by the interaction of acrylamide molecules with micelles, which is directly proven by various methods.

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