

ASSOCIATING POLYMERS PREPARED BY A MICELLAR POLYMERIZATION ROUTE

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A free radical micellar polymerization process has been used to prepare hydrophobically modified water-soluble copolymers based on acrylamide. In this process, the hydrophobe (1-5 mol% based on monomer feed) is solubilized within direct micelles whereas the water-soluble monomer is dissolved in the aqueous continuous phase. This method leads generally to multiblock copolymers in which the number and length of the hydrophobic blocks vary with the initial number of hydrophobes per micelle. The incorporation behavior of different types of hydrophobes and their effects on the rheological copolymer properties have been investigated. Interestingly, the use of disubstituted acrylamides leads to homogeneous samples with an average copolymer composition independent of the degree of conversion, in contrast to what is observed with monosubstituted acrylamides. The difference in polarity between the bulk phase and the micellar phase is responsible for this behavior. This microenvironment effect modifies the reactivity ratios of those hydrophobes capable of forming hydrogen bonds, whereas the reactivity of the other hydrophobes remains unaffected. The rheological properties of copolymers with molecular weights ranging from 10^5 to $2.5 \cdot 10^6$ have been studied as a function of polymer concentration, hydrophobe content and average block length, using steady flow and oscillatory experiments. For a given hydrophobic block length, the zero shear viscosity data follow a universal behavior as a function of the block density and the molecular weight. The results are discussed in terms of current theoretical models.