Synthesis, characterization, and solution properties of hydrophobically modified poly(vinyl alcohol).

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Abstract

A series of hydrophobically modified water-soluble poly(vinyl alcohol) (PVA) polymers was prepared by grafting urethanized PVA with varying fractions of fatty acid chlorides of various chain lengths. The objective of the synthesis was to prepare polymers that can be applied to enhanced oil recovery. The solution viscosity was investigated as a function of polymer concentration, temperature, shear rate, and salinity. Furthermore, the surface and decane-water interfacial tensions were investigated with respect to polymer and salt concentrations. Micelle formation was probed by measuring pyrene fluorescence as a function of polymer concentration. The solution viscosity was enhanced by the hydrophobic modification, compared with the unmodified PVA as a result of hydrophobic association. The viscosity of a 3% polymer solution decreased with increasing salt concentration from 0.0 to 6.0 wt %, above which some polymer precipitated from the solution. The solution viscosity decreased with both temperature and shear rate. Pyrene fluorescence measurements showed that hydrophobic micelles formed above a polymer concentration of 0.5%. The micelle formation was relatively insensitive to salt concentration. The surface tension decreased sharply with increasing polymer concentration to reach a minimum at a polymer concentration of 0.15% and then increased gradually up to a polymer concentration of 3%. Interfacial tension with *n*-decane showed a continuous decrease with polymer concentration.