

Application of Water Soluble Polymers in Chemical Enhanced Oil Recovery

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Abstract : Oil recovery from reservoirs using conventional oil recovery techniques like water flooding is less than 20%. Enhanced oil recovery (EOR) techniques are applied to recover additional oil. Surfactant-polymer flooding is a promising EOR technique used to recover residual oil from reservoirs. Water soluble polymers are used to increase the viscosity of displacing fluids. Surfactants increase the capillary number by reducing the interfacial tension between oil and displacing fluid. Hydrolyzed polyacrylamide (HPAM) is widely used in polymer flooding applications due to its low cost and other desirable properties. HPAM works well in low-temperature and low salinity-environment. In the presence of salts HPAM viscosity decrease due to charge screening effect and it can precipitate at high temperatures in the presence of salts. Various strategies have been adopted to extend the application of water soluble polymers to high-temperature high-salinity (HTHS) reservoir. These include addition of monomers to acrylamide chain that can protect it against thermal hydrolysis. In this work, rheological properties of various water soluble polymers were investigated to find out suitable polymer and surfactant-polymer systems for HTHS reservoirs. Polymer concentration ranged from 0.1 to 1 % (w/v). Effect of temperature, salinity and polymer concentration was investigated using both steady shear and dynamic measurements. Acrylamido tertiary butyl sulfonate based copolymer showed better performance under HTHS conditions compared to HPAM. Moreover, thermoviscosifying polymer showed excellent rheological properties and increase in the viscosity was observed with increase temperature. This property is highly desirable for EOR application.

Keywords : rheology, polyacrylamide, salinity, enhanced oil recovery, polymer flooding

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