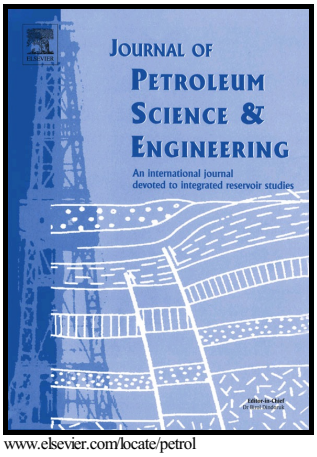

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Novel Hydraulic Fracturing Fluids with Improved Proppant Carrying Capacity and pH-Adjustable Proppant Deposition Behavior

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Abstract

In hydraulic fracturing, the design of the fracturing fluids is a crucial step in optimizing the effectiveness of hydrocarbon recovery. Herein, we describe a supramolecular dispersion with highly adjustable, reversible viscosity behavior, enabling control over the mobility, settling, and deposition of proppants. The supramolecular dispersion was obtained by complexation of an amino amide and maleic acid in an aqueous solution. The rheological properties of the developed fracturing fluid involving this supramolecular solution and proppant (silica sand) were characterized by frequency sweep and tixotropy tests, and settling studies. It was found that for a 2 wt.% dispersion, viscosity at zero shear rate could be adjusted by a factor of 1600 by changing pH from 3.8 to 8.3 in a reversible fashion. Settling studies revealed that the sedimentation velocity of sand particles decreased by five orders of magnitude from 2.3×10^{-3} m/s to 5.3×10^{-8} m/s upon an increase in pH from 4 to 8 in a reversible manner. Moreover, the supramolecular solution was found to maintain the rheological integrity even at NaCl concentrations above those of seawater. The significant reduction in the rate of proppant sedimentation and enhancement in the sedimentation stability were ascribed to the increased viscosity and the intermolecular and interparticulate interactions between proppant and

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