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Rheological and propagation of poly (N-isopropylacrylamide-co-acrylic acid) grafted montmorillonite dispersion in heterogeneous sand pack for improving sweep efficiency

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High water production is a major issue for upstream oil and gas operators due to massive water injection, reducing the water production while improving oil recovery from these fields is a key challenge. Polymer based gels have been widely used to improve reservoir conformance problems and to reduce excess water production. Unfortunately, polymer gels are not suitable for high temperature reservoirs (>100° C) because at high temperature polymer gels loss both stability and effectiveness. The present study reports on laboratories experiments carried out to investigate rheological properties and propagation of modified bentonite clay particles in a heterogeneous sand pack. A series of sand pack flooding tests were conducted on modified bentonite clay diluted in brines of various salinities, pH and various particles concentrations. Propagation, retention and dispersion of modified bentonite were studied in a heterogeneous sand pack represented by three parallel cylindrical cores flow model with different permeability. These tests evaluate injectivity and determine permeability reduction. Results showed that a high flow resistance developed across the sand pack demonstrating high retention and adsorption of modified bentonite in the sand pack. Results also suggested very significant advantages that modified bentonite could be selectively injected into high permeability zones due to low viscosity of particles dispersion. These positive results bring new promising insights for successful applications of modified bentonite.

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Iron-based ionic liquid as a highly effective catalyst for biodiesel production from used vegetable oils

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As conventional energy sources deplete, the need for developing alternate energy resources becomes more imperative and environment friendly. Used vegetable oils are attracting increased interest in this purpose. The methanolysis of used vegetable oil to produce a fatty acid methyl ester (FAME, i.e., biodiesel fuel) was catalyzed by commercial ionic liquid. The imidazolium chloride ionic liquid has been selected for the synthesis of biodiesel. The imidazolium tetrachloroferrate [bmim][$FeCl_4$] ionic liquid was prepared by direct combination between imidazolium cation and $FeCl_3$. The imidazolium chloride and imidazolium tetrachloroferrate ionic liquid were characterized by using FTIR, Raman spectroscopy, DSC, TG and UV. The factors affecting the transesterification process include: Reaction time, reaction temperature, weight of ionic liquid catalyst, Methanol:Oil molar ratio and reusability of the ionic liquid catalyst were studied. The yield was reached to 99 wt% under the optimum conditions of (1:8.33 catalyst to used vegetable oil weight ratio, 12:1 Methanol:Oil molar ratio, reaction temperature of 55° C and reaction time of 8 hours). Under these optimum conditions, the produced biodiesel is nearly the same as the commercial biodiesel with 7.8 Cp dynamic viscosity, 0.8925 g/cc density, 120° C flash point, -6° C pour point and 125 iodine value. Operational simplicity, reusability of the used catalyst for 7 times at least, high yields and no saponifications are the key features of this methodology.

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