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RESEARCH ARTICLE-PETROLEUM ENGINEERING

Greenly Synthesized Magnetite@SiO_2@Xanthan Nanocomposites and Its Application in Enhanced Oil Recovery: IFT Reduction and Wettability Alteration

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Abstract

Nanomaterials were used in enhanced oil recovery methods to improve the surface activity at the solid/oil/liquid contact line and remove oil through disjoining pressure gradient mechanism. The main objective of study is to prepare a green nanocomposites (NCs) and identify its effect on the interfacial tension (IFT) reduction and wettability alteration. A simple, economical and green technique was applied to synthesize Fe_3O_4@SiO_2@xanthan NCs from the *Alocasia macrorrhiza* plant extract. The prepared NCs were identified employing X-ray diffraction, Fourier-transform infrared spectroscopy, and scanning electron microscopy. The fabricated NCs at different concentrations (250 to 1500 ppm) were dispersed in distilled water to prepare the nanofluid solutions which were characterized by analyzing their viscosity, pH and conductivity properties. Additionally, the effect of the prepared nanofluids on the IFT reduction and wettability alteration of the crude-oil/aqueous-phase/rock system was examined. Obtained experimental results demonstrated a significant decrease in the values of IFT and contact angle under the effect of the synthesized NCs, which were reduced from 28.3 mN/m and 134° to 4.35 mN/m and 28°, respectively. Thus, the wettability of the used carbonate rock was greatly altered from a strong oil-wet to a strong water-wet system.

Keywords Green synthesis · Nanocomposite · Nanofluid · *Alocasia macrorrhiza* · Magnetite · Silicon dioxide