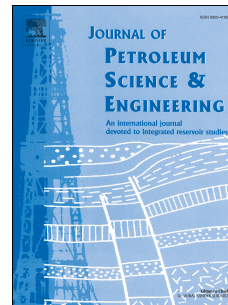


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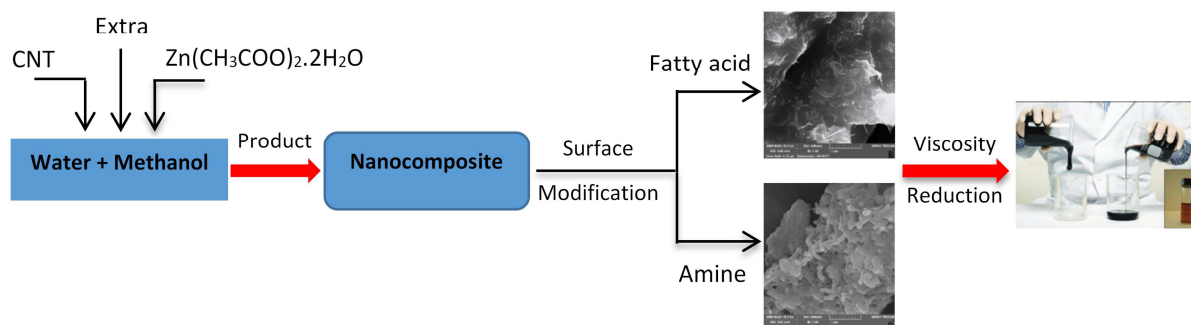
Impact of amine@ZnO/CNT and fatty acid@ZnO/CNT as hydrophilic functionalized nanocomposites on reduction of heavy oil viscosity

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Graphical Abstract



Abstract

One of the important features of heavy oil reservoirs is their high viscosity, which reduces the recovery factor of oil in these reservoirs. Thermal methods have traditionally been used for viscosity reduction in enhanced recovery process (EOR). However, these methods are not justifiable due to the high cost of steam energy production, the production of coke in the process, steam injection and environmental problems. Viscosity can be dramatically reduced with the help of nanoparticles, without using limited and controlled heat. In this study, ZnO/CNT nanocomposites, which have been made hydrophilic by surface modification operations, have been used as aqueous based nanofluids in enhanced recovery process. A heavy oil with viscosity of 402 cP at 80 °C was used in viscosity reduction tests. The results showed that the viscosity reduction of heavy oil from 402 cP at 80 °C to 74.90 and 16.23 cP at 80 °C is possible using reference nanofluids based on ZnO and CNT nanoparticles, respectively. In the next step, the

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