Evaluating the Oil Mobilization Properties of Nanoparticles Treated with Arabic Gum and Xanthan Gum for Trapped Oil in Porous Media

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DOI
http://dx.doi.org/10.2118/184332-MS
Document ID
SPE-184332-MS
Publisher
Society of Petroleum Engineers
Source
SPE Nigeria Annual International Conference and Exhibition, 2-4 August, Lagos, Nigeria
Publication Date
2016

Abstract

The flow of multiple fluid phases in porous media often results in trapped droplets of the non-wetting phase. Recent experimental and theoretical studies have suggested that nanoparticle aqueous dispersions may be effective at mobilizing trapped droplets of oil in porous media. Hypotheses to explain the observation include the nanoparticles' modification of solid wettability, changes in interfacial tension and interface rheology. The difficulty in observing droplet behavior on the pore scale has made the understanding of such mechanism still unclear. In this work, the relationship between nanoparticle concentration and microscopic

diversion of flow was investigated and how this impacts on the oil mobilization efficiency. Also investigated in this work was how the rheology of the dispersion medium for nanoparticles impacts on the overall recovery of trapped oil in porous media. A core flooding experiment was carried out on which aqueous solutions of different concentrations of the nanoparticle dispersion was used as the displacing fluid likewise rheological modified solutions of the nanofluids. The output of this work showed that the nanoparticle concentration impacts on the recovery of trapped oil through the microscopic diversion of fluid flow in porous media and this phenomenon in conjunction with earlier mention hypothesis effectively showed how nanoparticles enhances the recovery of trapped oil in porous media.

File Size 930 KB **Number of Pages** 6

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