Characterization of Emulsion Formation With Nanoparticles for Enhanced Oil Recovery

Characterization of emulsion formation (amount and droplet size) in the brine-oil-nanoparticle systems as a function of varying size of nanoparticles and modified brine salinity is presented. Different brines were used with a range from zero salinity for deionized water (DIW) to synthetic seawater (SSW), mimicking the salinity of North Sea water. Brines (FW1 and FW2) representing the composition of formation water obtained from different production wells (North Sea) were also used. Two model oils (decane (D) and hexane-hexadecane (HH) mixture of 1:1 vol. ratio) and a sample of North Sea crude oil (NSCO) were used. CaCO₃ nanoparticles of three different sizes of 15-40, 50, and 90 nm were used. Nanoparticles characterization was performed with Transmission Electron Microscopy (TEM). A commercially available sonication equipment, Branson Sonifier® SFX250, was employed for emulsion formation in brine-oil-nanoparticles systems. All the experiments were performed at room temperature for the same experimental conditions of 5 minutes of ultrasonic processing by using a 6.5 mm tapered microtip (sonication probe) with an output power of 30 W. Emulsion characterization (emulsion droplet size) was performed with an optical microscope (Axio Scope.A1). The effect of size of CaCO₃ nanoparticles and brine salinity on emulsion formation was investigated for different brine-oil systems. The results showed that the emulsion formation in brine-model oil (D and HH) systems was an inverse function of the size of nanoparticles i.e., a large amount of emulsion formation was observed for the smaller sized nanoparticles and vice versa. Emulsion characterization for these systems showed that the emulsion droplet size increased with an increase in size of the nanoparticles. Copyright 2018, Society of Petroleum Engineers

General information
Publication status: Published
Organisations: Department of Chemical and Biochemical Engineering, CERE – Center for Energy Resources Engineering, Center for Energy Resources Engineering, Centre for oil and gas – DTU
Contributors: Arshad, M. W., Feilberg, K. L., Shapiro, A., Thomsen, K.
Number of pages: 24
Publication date: 2018

Host publication information
Title of host publication: Proceedings of the SPE Kingdom of Saudi Arabia Annual Technical Symposium and Exhibition
Publisher: Society of Petroleum Engineers
Article number: SPE-192170-MS
DOIs:
10.2118/192170-MS
Source: RIS
Source ID: urn:0E5F58CBF3D18808F68BA06B54DEDD42
Research output: Chapter in Book/Report/Conference proceeding ▶ Article in proceedings – Annual report year: 2018 ▶ Research ▶ peer-review