Silicon Dioxide Nanoparticle Foam Stability in Tertiary Petroleum Production

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Abstract:
Nanoparticles have thrived in importance over the last decade with substantial end user and industrial applications. Additionally, one of the pioneering applications of foam is in enhanced oil recovery (EOR). However, a major stumbling-block to the success of foam application in EOR is due to the high mobility ratio between the displacing gas phase and the displaced oil phase [1]. In other words, such low-viscosity gas is more volatile than displaced oil or water in the reservoir. Leading it to channel through the reservoir that resulted in the early breakthrough of gas with large volume of hydrocarbon trapped in reservoir. Henceforth nanotechnology, through the mean of nanoparticles, has pave an alternative solution in heightening the rheological properties of fluids at ambient and elevated temperatures; though, pernicious influences take effect in particular nanoparticle concentrations. All in all, this lead to the objectives of the present work here which were to evaluate the effects of various surfactant and nanoparticle concentration as well as hydrocarbons with well-defined properties on foam stability. To do so, a comprehensive series of experiments at static state is conducted to investigate the foam stability of five different concentrations for surfactant and nanoparticle respectively in the absence and presence of white mineral oil in synthetic brine suspension. The motion stability test was conducted and make changes based on ASTM-D 6082-62 [2]. In the study, the motion stability of the aqueous foam was estimated by referring to the Ross-Miles method [3], by means of half-life capacities. The results suggested that there is a significant impact of the concentration of the surfactant and nanoparticle on foam stability. Besides, our results also suggested that less stable foam is illustrated in the presence of oil as compare to brine solution. The constraint of the procedure used in the present study to quantify foam stability includes measuring the decay of foam height over a certain period of time, which is a commonly used method in literature relating to half-life method.

Keywords: *Enhanced Oil Recovery; Rheological; Mobility Ratio; Half-Life Measurements*