Improving surfactant EOR by water salinity alteration

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Surfactant is routinely injected after waterflooding where substantial amount of oil trapped within the porous media. Surfactant, as one of the promising chemical enhanced oil recovery (CEOR), aims at lowering the interfacial tension (IFT) between the formation fluids. However, during the prodution, the technique was challenged by surfactant loss due to its adsorption onto native rock surface. Surfactant adsorption has been proved to be reversible, provided that a foreign material is introduced in the extended water process, which increases thereby the production cost. In this study rather, we investigated the desorption and subsequently the rate of reversibility by alteration process water, during intial and extended stages. Using sodium dodecyl benzene sulfonate (SDBS) as surfactant and Berea sandstone as adsorbent, we showed that the adsorption increased with salinity gradient, while desorption exhibited a reverse trend. Reducing water salinity from 3 and 5 to 1 wt.% NaCl, up to twofold of surfactant desorption was enhanced. This increment is owing to a better solubility in a less saline water and electrostatic repulsion. We extended the analysis to oil recovery, herein performed by spontaneous imbibition tests, using a light dead crude oil (API 31.06o). The results revealed an increase in oil recovery upto 4.6% of initial oil-in-place (IOIP) during extended water process by salinity alteration. The production was found subsequent to a decrease of about 82% in IFT. Furthermore, microscopic analysis of the sandstone surface after salinity alteration revealed that the increment in oil recovery was inherent to a reduction in pore blockage.

Biography

Ichhuy Ngo is currently pursuing his PhD at Kyushu University. His ongoing research focuses on improving oil recovey using chemical approaches. In the further phase, his research interest is integrating nanomaterials with the chemical EOR.

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