Aqueous stability studies of polyethylene glycol and oleic acid-based anionic surfactants for application in enhanced oil recovery through dynamic light scattering

Yan Irawan, author

Abstrak

The present study investigates the aqueous stability of polyethylene glycol and oleic acid- based anionic surfactants through the dynamic light scattering (DLS) and zeta potential methods, for application in enhanced oil recovery (EOR). Polyethylene glycol dioleate sulfonate (PDOS) surfactant solutions were prepared in concentrations of 0.05, 0.1, 0.3, 0.5, and 1 wt% in deionized water. Aqueous stability of PDOS was assessed by measuring the droplet size over five days, using nano particle analyzer HORIBA SZ-100 at 25oC. Results show that good aqueous stability of PDOS was achieved at concentrations of 0.1 to 1 wt%, but with the droplet size becoming unstable at the lowest concentration of 0.05 wt%. The polydispersity indices were classified into polydisperse distribution type recorded as 0.3 to 0.5 at concentrations of 0.05 and 0.1 wt% and 0.2 at concentrations of 0.3 to 1 wt%. The critical micelle concentration (CMC) of PDOS was 0.3% and the interfacial tension of PDOS surfactant above the CMC was around 10-3 dyn/cm. The zeta potential of PDOS surfactant without the addition of salt in concentrations of 0.05, 0.1, 0.3, 0.5, and 1 wt% was highly stable up to -96.8, -90.5, -89.6, -82.3, and -64.4 mV, respectively. With the addition of salt they were moderately stable at a concentration of 1 wt%. The conductivity increased with increasing concentration. The zeta potential of PDOS with the addition of salt was moderately stable in a concentration of 1%. Although PDOS with concentration of 0.05% showed a high value of zeta potential with the addition of salt, there is no guarantee that the PDOS surfactant solution will be stable for five days.