Synthesis and Characterization of Anionic Polypropoxylate Surfactants for Hybrid Process of ASP and CO$_2$ EOR

<u>홍성학</u>, 김연지, 양대성, 한형석, 박찬성, 류원선[†]

홍익대학교

(wsryoo@hongik.ac.kr[†])

Enhanced oil recovery (EOR) has been of interest since 1980's, and alkaline-surfactant-polymer (ASP) flooding is considered as the most practical method to increase oil production. CO$_2$ flooding is now the most promising technology for carbon capture, utilization, and sequestration (CCUS). The objective of this study is to develop versatile surfactant formulations for both ASP and CO2EOR process. Anionic polypropoxylate surfactants were prepared by three-step synthesis: propoxylation of dodecanol followed by sulfation and neutralization. The emulsion phase behavior of the surfactants were systematically investigated with varying propylene oxide (PO) number and degrees of sulfation. With an increase in PO number, the surfactant showed increasing hydrophobicity. The middle phase microemulsions were formed in the range of optimum salinity 4 to 7 gNaCl/L as the average PO number decreased from 12 to 7. CO$_2$-in-Water foams with the surfactants exhibited a shear-thinning behavior of decreasing apparent viscosities from a few tens of cP to *ca.* 1 cP with increasing flow rate. The foam showed an increasing stability up to several weeks of half-life with increases in the pressure and the temperature.