

Preparation of anionic surfactants for CO₂ EOR applications

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With increasing practices of carbon capture, utilization and sequestration (CCUS), CO₂-flooding has become the most profitable technology for enhanced oil recovery (EOR). The conventional CO₂-EOR performance may be improved by Water-Alternating-Gas (WAG) method. However, injected gas of WAG tends to rise upward in reservoir due to gravity, and this leads to a decrease in oil recovery efficiency. Foam-Assisted-WAG (FAWAG) creates a foam barrier between water and gas interface which impedes CO₂ channeling and further improves the sweep efficiency. The objective of this study is to develop surfactant formulations for FAWAG 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. With an increase in PO number up to 20, the surfactant showed increasing hydrophobicity. The foam generated by the surfactant with PO number 20 showed the most prolonged stability up to several weeks of half-life.