ABSTRAK

STUDI PENGARUH SALINITAS TERHADAP MEKANISME INJEKSI SURFAKTAN *ALKYL ETHOXY CARBOXYLATE* MELALUI UJI *COREFLOODING* DALAM PENINGKATAN PEROLEHAN MINYAK

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Enhanced Oil Recovery (EOR) merupakan metode produksi tersier yang bertujuan meningkatkan perolehan minyak sisa di reservoir. Salah satu metode EOR yang banyak digunakan adalah injeksi surfaktan *Alkyl Ethoxy Carboxylate* (AEC) karena memiliki kemampuan yang baik dalam menurunkan IFT, membentuk mikroemulsi, dan memobilisasi minyak residual. Kinerja surfaktan AEC sangat dipengaruhi oleh salinitas yang berperan dalam pembentukan mikroemulsi dan efektivitas penurunan IFT. Oleh karena itu, penelitian ini dilakukan untuk menganalisis pengaruh variasi salinitas terhadap kinerja surfaktan anionik AEC pada sistem minyak ringan untuk aplikasi EOR.

Penelitian dilakukan menggunakan surfaktan AEC dengan variasi konsentrasi dan salinitas *brine* sintetik NaCl pada temperatur 60°C. Pengujian yang dilakukan meliputi *Critical Micelle Concentration* (CMC), *aqueous stability*, *interfacial tension* (IFT), *phase behavior*, serta *coreflooding*. Pengujian tersebut bertujuan untuk mengevaluasi pengaruh salinitas terhadap stabilitas surfaktan, pembentukan mikroemulsi, nilai IFT, dan peningkatan *recovery factor*.

Hasil penelitian menunjukkan bahwa surfaktan AEC stabil pada seluruh variasi salinitas yang diuji. Nilai IFT minimum pada sistem *crude oil* sebesar 3×10^{-3} dyne/cm dicapai pada konsentrasi surfaktan 2,5% w/w, sedangkan pada *sistem n-decane* sebesar $8{,}3 \times 10^{-2}$ dyne/cm pada konsentrasi 1,25% w/w. Pengujian *phase behavior* menunjukkan bahwa kondisi optimum belum tercapai karena tidak ditemukan perpotongan kurva *oil* dan *water solubility ratio*. Namun, hasil *coreflooding* menunjukkan bahwa surfaktan yang membentuk mikroemulsi Winsor III menghasilkan *recovery factor* lebih tinggi, yaitu sekitar 34,78% OOIP, dibandingkan surfaktan yang hanya menghasilkan kondisi *ultra low* IFT sebesar 25,21% OOIP.

Kata kunci: *coreflooding*, EOR, IFT, salinitas, surfaktan

ABSTRACT

STUDY OF THE EFFECT OF SALINITY ON THE INJECTION MECHANISM OF ALKYL ETHOXY CARBOXYLATE SURFACTANTS THROUGH COREFLOODING TEST IN INCREASING OIL RECOVERY

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Enhanced Oil Recovery (EOR) is a tertiary recovery method aimed at increasing the recovery of residual oil from reservoirs. One of the widely used EOR techniques is the injection of Alkyl Ethoxy Carboxylate (AEC) surfactants due to their effectiveness in reducing interfacial tension (IFT), forming microemulsions, and mobilizing residual oil. The performance of AEC surfactants is strongly influenced by salinity, which plays an important role in microemulsion formation and the effectiveness of IFT reduction. Therefore, this study was conducted to investigate the effect of salinity variation on the performance of anionic AEC surfactants in a light oil system for EOR applications.

The study was conducted using AEC surfactants with various surfactant concentrations and NaCl synthetic brine salinities at a temperature of 60°C. The experimental program included Critical Micelle Concentration (CMC), aqueous stability, interfacial tension (IFT), phase behavior, and coreflooding tests using crude oil and n-decane as test fluids. These experiments were carried out to evaluate the effect of salinity on surfactant stability, microemulsion formation, IFT reduction, and recovery factor improvement.

The results showed that the AEC surfactant remained stable across all salinity ranges tested. The minimum IFT for the crude oil system was 3×10^{-3} dyne/cm at a surfactant concentration of 2.5% w/w, while the minimum IFT for the n-decane system was 8.3×10^{-2} dyne/cm at a concentration of 1.25% w/w. Phase behavior analysis indicated that the optimum condition was not achieved, as no intersection was observed between the oil and water solubility ratio curves. However, coreflooding results demonstrated that surfactants capable of forming Winsor Type III microemulsions achieved a higher recovery factor of approximately 34,78% OOIP, compared to surfactants that only produced ultra-low IFT conditions, which achieved approximately 25,21% OOIP.

Keywords: coreflooding, EOR, IFT, salinity, surfactan