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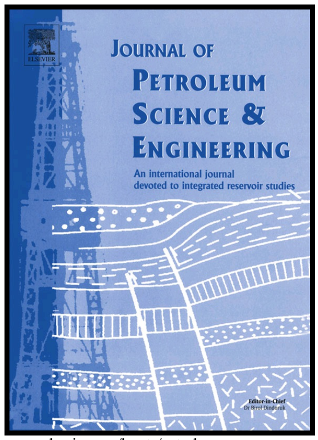

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Abstract

Many laboratory results have proved potential of low salinity water injection (LSWI) for improving oil recovery in sandstone formation. Some one-dimensional models have been developed to describe the low salinity effect and possible driving mechanisms.

The objective of this study is to develop two-dimensional model based on two different approaches, linear relationship proposed by Jerauld et al. (2008) and multi-ion exchange (MIE) model of Omekeh et al. (2012), for LSWI in sandstone formation. Furthermore, capillary pressure concept that is usually neglected in calculations is taken into account.

The developed model successfully matched the experimental data. The model and experiments matched on a number of criteria such as oil recovery, and pressure drop. Wettability alteration from weakly oil-wet toward mixed-wet can be considered as the probable driving mechanism as a result of cation exchange.

In the end, based on each approach's matching quality history, the application range for each method is addressed in this paper. However, the MIE approach is a more realistic representative of low salinity condition.

Keywords: Low Salinity Water; Multi-ion Exchange; Wettability Alteration; Capillary Pressure; Relative Permeability

Nomenclature

γ_i: Activity coefficient

ARD: Average Relative Deviation

CEC: Cation Exchange Capacity

$K_{Ca\text{-}Na}$: Selectivity factor between Ca^{+2} and Na^{+}

$K_{Mg\text{-}Na}$: Selectivity factor between Mg^{+2} and Na^{+}

K_o^*: Oil endpoint relative permeability

K_{ri}: Relative permeability