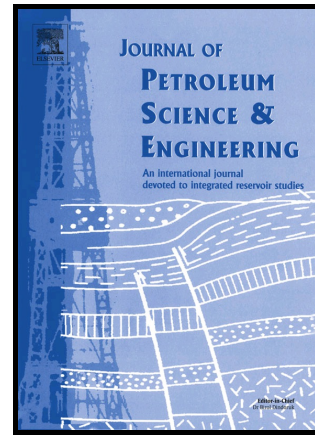


Author's Accepted Manuscript

Modelling Low-Salinity Waterflooding: Effect of Divalent Cations and Capillary Pressure

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www.elsevier.com/locate/petrol

PII: S0920-4105(16)30574-5
DOI: <http://dx.doi.org/10.1016/j.petrol.2016.10.012>
Reference: PETROL3672

To appear in: *Journal of Petroleum Science and Engineering*

Received date: 2 June 2016
Revised date: 3 October 2016
Accepted date: 4 October 2016

Cite this article as: Arash Etemadi, Elnaz Khodapanah and Seyyed Alireza Tabatabaei-Nejad, Modelling Low-Salinity Waterflooding: Effect of Divalent Cations and Capillary Pressure, *Journal of Petroleum Science and Engineering* <http://dx.doi.org/10.1016/j.petrol.2016.10.012>

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1 Modelling Low-Salinity Waterflooding: Effect of Divalent Cations and 2 Capillary Pressure

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7 Abstract

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

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

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

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

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

24 Nomenclature

25 γ_i : Activity coefficient

26 ARD: Average Relative Deviation

27 CEC: Cation Exchange Capacity

28 K_{Ca-Na} : Selectivity factor between Ca^{+2} and Na^+

29 K_{Mg-Na} : Selectivity factor between Mg^{+2} and Na^+

30 K_o^* : Oil endpoint relative permeability

31 K_{ri} : Relative permeability

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