



Contribution ID: 407

Type: **Poster (+) Presentation**

Surface Complexation Modeling on the Electrochemical Interactions of Low Salinity Waterflooding in Sandstone Reservoir

Tuesday, 1 June 2021 10:00 (1 hour)

Low salinity waterflooding (LSW) attracts increasingly attentions in recent years. It has been proposed that the enhanced oil recovery by LSW (or low salinity response) is triggered by the electrochemical interactions (e.g., electrostatic interactions, multiple ion exchange, chemisorption, etc.) between brine, rock, and oil. This study used the methodology of surface complexation modeling to characterize those electrochemical interactions when LSW was applied in a sandstone reservoir, as well to investigate the influential factors (e.g., ionic chemistry, quartz and kaolinite contents, acid and base numbers of oil, etc.) of low salinity response. The modeling results indicated that the electrical repulsions of sandstone and oil surfaces contributed to the detachment of oil from sandstone surface and hence the low salinity response. The results also suggested that (1) the negativity of sandstone showed a complex change with the increase of NaCl concentration (0.001-10.0 mol/L) and its maximum value reached at 0.1 mol/L NaCl concentration, while the negativity of oil decreased with the increase of NaCl concentration, especially, the decrease became very pronounced below 0.1 mol/L NaCl concentration, which resulted in a salinity threshold for low salinity response; (2) Both the negativities of sandstone and oil were enhanced with the presence of SO_4^{2-} ions in the salt solution but were compromised by Ca^{2+} and Mg^{2+} ions; (3) The negativities of sandstone and oil increased with the increase of pH, especially from pH=5 to pH=7; (4) The negativity of kaolinite was extremely small in high salinity water, however, it was moderately smaller than that of quartz in low salinity water, indicating that the kaolinite charge change played important roles in low salinity response; (5) The negativity of oil seems to be greatly influenced by the base number compared to the acid number. The findings of this study might theoretically guide the application of LSW in sandstone reservoir.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

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Session Classification: Poster +

Track Classification: (MS19) Electrochemical processes in porous media