A NEW EOR METHOD FOR SANDSTONE RESERVOIRS USING HIGH PH CHELATING AGENTS

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Abstract

Chelating agents have been used widely in the oil industry as stimulation fluids. They are used to stimulate sandstone and carbonate reservoirs. EDTA (Ethylenediaminetetraacetic acid) chelating agent is a common example which is stable at high temperature (200°C) and has high ability to chelate multivalent cations from brine solution. It can form stable complex compounds with these cations. EDTA does not cause any damage to the rock or form precipitation.

In this study, different chelating agents were used as enhanced oil recovery fluids for sandstone reservoirs. Core flooding tests were performed using Na4EDTA, NH4EDTA, and HEDTA with different concentrations, and different pH values to flood Berea sandstone cores. Flooding experiments were conducted using chelating agent solutions diluted in sea water at secondary and tertiary stage. Zeta potential was measured along with effluent ions analysis to explain the main mechanism for the additional oil recovery using chelating agents.

The coreflood experiments results showed that the chelating agent was able to give additional oil recovery up to 30% from the OOIP after sea water flooding. Also, the results showed that EDTA at pH 12.2 showed the best results. High concentration EDTA was able to chelate calcium, magnesium, and iron from the rock. As the concentration of EDTA in the solution with sea water increased, the chelation of these cations increased and oil recovery increased. Zeta potential measured for different fluid types and different concentrations with the crushed Berea sandstone showed that chelating agents changed the rock
charge to higher negative value than deionized water. Also, iron ions changed the Zeta potential value when added to the low salinity water (TDS =5,767 ppm) but did not affect the value when chelating agent was added to the solution.