Experimental Verification of Different Low Salinity Water flooding Proposed Mechanisms in Sandstones

Alaeddine Abdelmajid Bouazza

Abstract

Low salinity waterflooding (LSWF) research has gained more momentum in recent years for both sandstone and carbonate reservoirs. Published laboratory data and field tests showed an increase in oil recovery by changing injected brine salinity, especially for sandstone reservoirs. The main objective of the current study is to investigate/verify different mechanisms (fines migration, multi component ion exchange, rock dissolution and pH increase) proposed for the increase in oil recovery as LSWF takes effect.

The impact of LSWF on oil recovery was investigated by conducting coreflood experiments using Berea cores, light crude oil and synthetic brine. The brine was diluted by mixing it with de-ionized water. Two sets of coreflood experiments (at 100% water saturation and at irreducible water saturation) were conducted in this study.

Measurements of cations concentration (Mg^{2+}, Ca^{2+} and Al^{3+}) in the coreflood effluent samples, pH, turbidity and ion exchange analysis as well as permeability and pressure drop, indicated that fines migration and rock dissolution mechanisms do exist in low salinity waterflooding in sandstones. The critical salinity at which fines start moving was observed to be around 670 ppm. The reduction in absolute permeability due to fines migration goes up to 60% of the initial permeability. No indication of multi-component ion exchange and pH increase suggested mechanisms was observed from the LSW coreflooding.