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Title: Understanding the Enhanced Oil Recovery (EOR) in UK Reservoirs.

Low-Salinity water flooding (patented as the LoSal® process by BP), an enhanced oil recovery method, has been identified in laboratory works and small scale field implementations having potential to contribute to oil production during secondary and tertiary recovery of a conventional oil reservoir. The wettability of pore surfaces can significantly control the production of the reservoir. In the case of the LoSal® process, favourable initial conditions will be oil- to mixed- wet conditions. After the flood water is injected, these conditions will change to water-wet, leading to more incremental oil recovery. There are several mechanisms proposed for this effect on the wettability: increased pH and reducing of the interfacial tension, fine mobilisation, multi-ion exchange and double layer expansion. These mechanisms are affected by the initial pH and salinity of the reservoir brine, initial clay content and the oil composition in terms of acidic and basic oil molecules. One factor that is least examined so far is how iron (Fe) in clay minerals can affect their wettability in relation to the reduction-oxidation state of the reservoir. The reservoir initially may be in a reduced state and any different water injected can potentially turn this to an oxidizing state. Fe^{3+} iron particles have been shown to promote oil wetness, an unfavourable effect for any EOR project. In order to examine the effects of the redox state of the iron, in this project, clay mineral films have been made to measure contact angle of crude oil in both reducing and oxidizing states prior to, and after, low-salinity water flushing of the clay mineral films.