
Investigation of the Effect of Temperature and Pressure on Interfacial Tension and Wettability of Shu'aiba reservoir, Saudi Arabia

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Both interfacial tension (IFT) and wettability of the fluids/rock system affect the distribution of fluids within reservoir rock material. The fluids distribution strongly affects the flow behavior and oil recovery. Most of the available data on wettability of core samples including contact angle and IFT for crude oil/brine systems are for room temperature and atmospheric pressure. Since actual values of reservoir temperature and pressure are frequently encountered in oilfields simulation models, a need to study IFT and wettability at reservoir conditions was recognized. This paper is an investigation of the influence of temperature and pressure on IFT and wettability of Lower Cretaceous Arabian carbonate reservoir. Contact angle measurements were used to quantify wettability on calcite crystal and natural rock material.

Experimental results of IFT for both dead oil-brine and live oil-brine systems as well as contact angles of live oil-brine/calcite and live oil-brine/rock material systems over a range of temperature and pressure are reported. The IFT between dead oil and brine decreased with increasing temperature and increased with increasing pressure at constant temperature. For live oil-brine system an opposite trend of increase in IFT values with temperature was found. A significant increase in IFT values occurred with time. At reservoir conditions, the IFT of live oil was higher than that of dead oil. Contact angle values for live oil-brine/rock material system (at P = 3,000 psig) increased with temperature and with aging time. Four to six days are required to stabilize and obtain constant values of contact angle. Data reflects neutral to slightly water-wet character of Shu'aiba reservoir rock material.
