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Effect of ionic liquids on the efficiency of crude oil recovery

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Abstract

Enhanced Oil Recovery (EOR) methods are used to raise Recovery factor (Rf) above almost 40% of Original Oil In Place (OOIP). This process is conducted owing to the large amount of crude oil which remains in the reservoir after production using conventional methods. Difficulties in producing large amount of crude oil by traditional methods can be tackled using new methods to raise recovery factor above the traditional threshold. Surfactant flooding is one of the most important methods used in the enhanced oil recovery. Surfactants are tested for their effectiveness as alternatives to conventional methods in oil recovery. These surfactants are aimed to decrease the IFT between brines and crude oil, despite some disadvantages such as high cost, high toxicity. In addition theses chemicals are able to make any damage for oil reservoir due to the adsorption property on grain surface. In the case study, the conducted investigation is planned to use ionic liquids (ILs) instead of surfactants. Following the screening on ILs, results have indicated that Ammoeng 102 was the favored type. Using Ammoeng 102 ILs, IFT measurement was set according to (1) type and concentration of ILs, (2) type and salinity of brine, (3) pressure, and (4) temperature variation up to reservoir conditions. Regarding the IFT evolution, results have indicated that values undergo a sharp exponential decrease with increasing ILs concentration. In addition, drop in IFT becomes very small after certain concentration (critical micelle concentration or CMC). Based on flooding process, results show that 10% brine salinity can be better than 20% brine salinity in secondary flooding, while the opposite will happen in tertiary flooding by the use of ILs. This demonstrates the effectiveness of ILs in recovering oil increases with increasing diluted solution salinity. However, tertiary flooding can be used because it is less expensive than secondary flooding.

Biography

Dr M.S Benzagouta has completed his PhD since 1991 from the University of Newcastle upon Tyne (U.K). He is a member of staff at the department of Petroleum and natural gas Eng King Saud University (KSA0. He is the Principal Investigator for the EOR Al Amoudi Chair. He has published more than 20 papers in most reputed petroleum journals. He has served as reviewer for different journals.