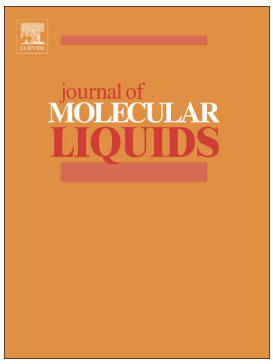

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Synthesis and characterization of eight hydrophilic imidazolium-based ionic liquids and their application on enhanced oil recovery

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Abstract

In order to difficulties in producing large amount of crude oil and remaining oil by primary and secondary oil recovery processes, enhanced oil recovery (EOR) techniques have been developed. Water injection is one of the EOR methods which has shown great potential in recent years. The water flooding process is more effective when the injected water is enriched by chemicals which improves the oil recovery by reducing interfacial tension (IFT) and alternating wettability. In this work eight long alkyl chain imidazolium based ionic liquids (ILs) including Octyl, Decyl, Dodecyl and Tetradecyl methylimidazolium and two different anions namely Chlorid and trihydrogen diphosphate (THDP), were synthesized and characterized by ^{1}HNMR and elemental analysis. As a nobility it should be noted that ILs containing THDP anion have not been synthesized yet and they were used in upstream oil industry for the first time. Furthermore, some physicochemical properties were investigated for studied ILs as a function of temperature. The synthesized ILs were examined as additives in injected water to reduce the IFT in water flooding process. The critical micelle concentration (CMC) point and IFT of enriched sea water by ILs/crude oil, were measured as a function of ILs concentration. The results showed that ILs can be good candidates for EOR technology due to their significant behavior in IFT reduction and their low consumption. The consumed concentrations for ILs were observed at ppm levels, so they are favorable choices when economic concerns are considered. According to obtained results, as the alkyl chain was longer, the CMC point and IFT values were lower. Moreover the investigation of IFT values, revealed that ILs containing THDP anion were more efficient in IFT reduction compared with ILs including chloride anion. [C_{14}mim][Cl] and [C_{14}mim][THDP] were the most effective ILs which 50 and 25 ppm of these ILs, reduced the IFT values to 0.65 ± 0.04 and 0.5 ± 0.02, respectively.

Keywords: Hydrophilic ILs, Synthesis, IFT, CMC point, EOR.

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