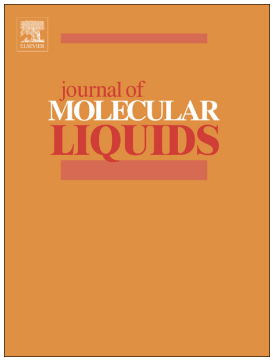

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Synthesis of Novel Water Soluble Poly (Ionic Liquids) Based on Quaternary AmmoniumAcrylamidomethyl Propane Sulfonate for Enhanced Oil Recovery

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Abstract

Ionic liquid monomers and polymers have recently attracted attention as chemical agents for enhanced oil recovery. Poly (ionic liquids) (PILs) combine both the unique thermal characteristics of ionic liquids and the flexibility and durability of macromolecular architectures creating novel materials with superior characteristics and applications. In this work new hydrophilic, thermal stable and flexible PILs based on 2-acrylamido-2-methylpropane sulfonic acid (AMPS) copolymers with methacrylic acid (MAA), acrylamide (AAM) and N-vinyl pyrrolidone (VP) were prepared, characterized and tested as EOR chemicals. The interaction mechanism of the prepared PILs with crude oil, seawater and reservoir rocks at elevated temperature and/or pressure was explored with different techniques. Among these are the PILs chemical structures, thermal stability, contact angle, zeta potential, adsorption and interfacial tension measurements. All measurements point out to wettability alteration as main recovery mechanism. 2-acrylamido-2-methylpropane sulfonic acid (AMPS) copolymer with MMA was found to be the most efficient among the other PILs and it was used in multiple flooding runs in secondary and tertiary modes. Clearly, recovery was improved with PIL solution and all flooding scenarios provided close recoveries. However, secondary flooding of 0.4 pore volume of PIL followed by continuous seawater was the most feasible since limited quantity is needed to provide the ultimate recovery.

Keywords: Poly(Ionic liquids), Enhanced Oil recovery, Wettability, Quaternary Ammonium Acrylamidomethyl Propane Sulfonate.