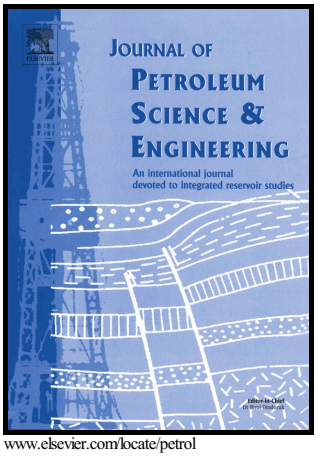

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Study of adsorption/desorption properties of a new scale inhibitor package to prevent calcium carbonate formation during water injection in oil reservoirs

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ABSTRACT

Injection of an aqueous solution of scale inhibitor during the water flooding is the primary method to prevent inorganic salt formation. Adsorption/desorption abilities of scale inhibitors are key factors that influence the success of the scale inhibitor squeeze treatments. In this work, the performance of a new developed scale inhibitor has been evaluated to prevent calcium carbonate precipitation under static and dynamic conditions.

Prior to any core flooding experiments, saturation index of calcium carbonate and the amount of its precipitation were studied at different mixing ratios of the synthetic injection and formation waters at different temperatures. Then, effectiveness of the scale inhibitor package and its minimum concentration were determined. During the core flooding experiments, adsorption characteristics of the scale inhibitor package were investigated using carbonate, quartz sand and quartz glass core samples. For each test, the inhibitor solution was injected into the core samples and its concentration was measured before and after passing through the core samples. Moreover, specific adsorption of the scale inhibitor package was determined at different injection rates.

For the carbonate samples, adsorption equilibrium of the scale inhibitor package occurred in the lower pore volumes injected. Furthermore, improvement in the adsorption ability of the scale inhibitor package occurred due to the presence of various chemical reagents in the composition of the scale inhibitor package. In this study, desorption process has been also studied on carbonate rocks. The results showed that the best performance of desorption process was obtained when the concentration of hydrochloric acid was 10 % in the developed scale inhibitor package. In addition, reduction in dynamic viscosity of oil was observed in the presence of the scale inhibitor package. Interfacial tension on the boundary of oil and the aqueous solution of the scale inhibitor package was significantly reduced by an increase in the concentrations of polyethylene polyamine-N-methylphosphonic acid (PPNMP) and hydrochloric acid as the components of the inhibitor package.

Abbreviation

ATMP, Aminotrimethylenephosphonic acid; *DTPMP*, Diethylenetriamine penta (methylene phosphonic acid); *HEDP*, 1-hydroxyethane- 1, 1-diphosphonic acid; *PBTC*, 2-phosphonobutane-1,2,4-tricarboxylic acid; *PPCA*, Polyphosphino carboxylic acid; *PPNMP*, Polyethylene polyamine-N-methylphosphonic acid; *SG*, Sodium gluconate

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