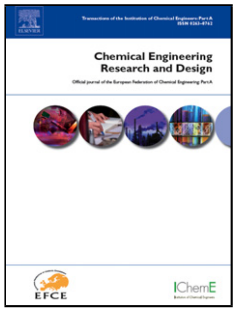

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Characterization of Viscous Fingering during Displacements of Low Tension Natural Surfactant (LTNS) in Fractured Multi-Layered Heavy Oil Systems

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Abstract

Characterization of viscous fingering in low tension displacements especially for heavy oil surfactant pair in heterogeneous systems is neither straight forward nor well understood. A major technical challenge in low tension flooding is that a fingered pattern at the displacement front may occur. Therefore, it is essential to predict the nature of instability, to avoid viscous fingering, or, where it is inevitable, to be capable of applying it as an additional modeling parameter. In this work layered porous models containing fractures with different geometrical properties were used and the finger behavior during displacement of LTNS, as a new EOR agent, in heavy oil was quantified. Dynamic propagation of the fingers independent to the type of heterogeneity is well correlated with the dimensionless displacement time in a linearly form. And also, the rate of finger growth is nearly independent to the type of medium heterogeneity. When injection is scheduled through high permeable region in a multi-layer heterogeneous media, the number of macrofingers increased. The level of bypassed oil linearly decreases with increase in dimensionless distance traveled by front with a good precision for all heterogeneous patterns. In