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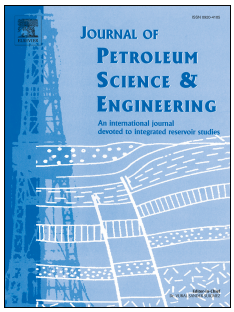

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Modeling Cementation in Porous Media during Waterflooding: Asphaltene deposition, Formation dissolution and their Cementation

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Abstract

Waterflooding due to water availability, ease and low cost is the most common technique for maintaining reservoir pressure and increasing the recovery of oil. However, the injected water may chemically interact with the reservoir fluids and rock, and it could cause asphaltene deposition and rock dissolution. This paper provide details of the state of the art research performed on characterizing these processes and their effects. It is observed that the dissoluted particles may precipitate on the deposited asphaltene in the porous media leading to cementation. Where this cementation might cause an irreversible and permanent impairment of reservoir porosity and permeability, reducing the productivity of the whole waterflooding operation: decreasing oil productivity and water injectivity.

In the development of the proposed model, the radial flow geometry has been adopted and a solution is sought to predict the deposition of asphaltene, rock dissolution and precipitation with respect to time and space. The developed model also predicts the phenomenon of cementation in the porous media and different factors that will enhance cementation. These factors includes: asphaltene concentration, water injection rate, injection period, the depth and temperature of the reservoir. It is found from the detailed analysis that the cementation remain very low but it could cause complete pore plugging with time. The derived cementation model assumes that the temperature of reservoir remain constant during waterflooding and the interfacial tensional forces are negligible. But practically the latter may support the cementation process.

Keywords

Waterflooding; asphaltene deposition; carbonate dissolution; precipitation; cementation.

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