عنوان مقاله:

Investigation of Water Salinity Effect on Asphaltene Precipitation Using PC-SAFT EOS

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خلاصه مقاله:

Asphaltene precipitation has attracted more attention in low-salinity water flooding processes in the last decade. In this study, ePC-SAFT equation of state has been used to investigate the effect of water salinity on asphaltene precipitation. To this end, a solid model with a synthetic oil containing heptane and toluene with a ratio of ۷۰ to ۳۰ was used to predict asphaltene precipitation. Three adjustable parameters in the Particle Swarm Optimization method were used to minimize the absolute average deviations (AAD) between experimental and modeling values. The role of water chemistry on asphaltene precipitation was addressed by changing the composition of seawater (SW) by tuning ionic strength and manipulating divalent ions. Also, to get further insights into the role of divalent ions (Mg^{2+}, Ca^{2+}, SO_4^{2-}), three makeup water containing $MgCl_2$, $CaCl_2$ and Na_2SO_4 salts were used. Results showed that in low concentrations of salts (۵۰۰۰ ppm), the asphaltene molecules migrate to the oil/water interface, leading to a decrease in asphaltene precipitation. Beyond this concentration, asphaltene precipitation was increased due to the breaks of the bonding between ion-asphaltene. As to results, a lower precipitation level was observed for the case of dilution seawater (۰.۵ SW and ۰.۱SW) that could be discussed in terms of electrical double- layer expansion. The results of the comparison between modeling and experimental data show that the proposed model can predict asphaltene precipitation for $MgCl_2$, $CaCl_2$ and Na_2SO_4 brine with absolute relative deviations less than ۷.۶۸%, ۵.۴۴% and ۸.۳۹%. The finding from this study elucidates the importance of water salinity to design an applicable low-salinity water flooding.

کلمات کلیدی:

Solid model, Asphaltene precipitation, ePC-SAFT EOS, low-salinity water flooding

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