عنوان مقاله:

Population Balance Modeling of Asphaltene Aggregation in Crude Oil at Different Temperatures

محل انتشار:

هفتمین کنفرانس بین المللی مهندسی شیمی و نفت (سال: 1400)

تعداد صفحات اصل مقاله: 9

نویسندگان:

Ali Zahedi-Nejad - *Department of Gas Engineering, Ahvaz Faculty of Petroleum, Petroleum University of Technology (PUT), Kout-Abdollah, Ahvaz, Iran*

Masoud Bahrami - *Department of Gas Engineering, Ahvaz Faculty of Petroleum, Petroleum University of Technology (PUT), Kout-Abdollah, Ahvaz, Iran*

Mohammad Torkaman - *Department of Chemical Engineering, Faculty of Engineering, Shahid Chamran University of Ahvaz, Ahvaz, Iran*

خلاصه مقاله:

In the present study, asphaltene aggregation was investigated from kinetic aspects through a series of experiments at different temperatures. An optical microscope was used to monitor aggregate size growth in the applied additive-free light crude oil. The results demonstrated a higher rate of asphaltene aggregation at higher temperatures, indicating the superior effect of viscosity reduction to solubility increase on asphaltene aggregation at higher temperatures. A population balance model was developed to foresee the size evolution of asphaltene aggregates. In this model, only Brownian motion was considered as the mechanism of aggregation and therefore the Brownian kernel of Smoluchowski was incorporated into the model. A fractal dimension of ۲.۵ was measured and selected as an input of the model. Collision efficiency was the sole adjustable parameter in the modeling and a root-mean-square error (RMSE) was assumed for the objective function of the modeling. The results of the model desirably matched experimental data and an average value of ۱۰.۰۷ % for error was obtained. Additionally, an incremental trend in collision efficiency with temperature was observed.

کلمات کلیدی:

Asphaltene, temperature, aggregation, modeling, collision efficiency