

عنوان مقاله:

A Numerical Simulation Study on the Kinetics of Asphaltene Particle Flocculation in a Two-dimensional Shear Flow

محل انتشار:

فصلنامه علوم و فناوری نفت و گاز، دوره 8، شماره 2 (سال: 1398)

تعداد صفحات اصل مقاله: 20

نویسندگان:

Hadi Bagherzadeh - *Ph.D. Candidate, Petroleum Engineering Department, Amirkabir University of Technology, Tehran, Iran*

Zahra Mansourpour - *Assistant Professor, Chemical Engineering Department, University of Tehran, Tehran, Iran*

Bahram Dabir - *Professor, Petroleum Engineering Department, Amirkabir University of Technology, Tehran, Iran*

خلاصه مقاله:

In the current study, the kinetics of asphaltene particle flocculation is investigated under a shear flow through numerical simulation. The discrete element method (DEM) is coupled with computational fluid dynamics (CFD) to model the agglomeration and fragmentation processes. In addition, a coalescence model is proposed to consider the attachment of colliding particles. The changes in mean asphaltene floc size, the particle size distribution (PSD) of asphaltene flocs over simulation time, and the average fractal dimension are presented. Moreover, the effect of fluid velocity on the kinetics of asphaltene flocculation is examined. The mean asphaltene floc size increases exponentially at first, and then the growth slows; finally, it ceases due to the establishment of a dynamic equilibrium between the agglomeration and fragmentation processes. As expected, asphaltene PSD's move from fine to coarse sizes during the simulation. Log-normal distribution matches the PSDs best, which is in agreement with the nature of asphaltene. As fluid velocity increases, the dynamic equilibrium is attained more rapidly at a smaller mean floc size and higher average fractal dimension; furthermore, PSDs shift to smaller asphaltene floc sizes. The obtained average fractal dimensions of the asphaltene flocs are in the range of 1.65 to 1.74, which is compatible with the values reported in the literature. Eventually, a semi-analytical model is utilized to fit the simulation results. It is found out that the semi-theoretical model is capable of predicting the evolution of asphaltene particle size appropriately.

کلمات کلیدی:

Asphaltene Flocculation, Kinetics, discrete element method, Computational Fluid Dynamics

لینک ثابت مقاله در پایگاه سیویلیکا:

<https://civilica.com/doc/896181>

