

70b Stability and Coalescence of Emulsion Droplets in a Constricted Tube

Le Yan, Karsten E Thompson, and Kalliat T Valsaraj

Understanding the coalescence behavior of emulsion droplets in porous media is important for the control and design of many processes such as enhanced oil recovery and subsurface remediation. A model was developed that employs the boundary element method coupled with an explicit model for film stability. Using this model, we have numerically studied the dynamics and coalescence of a pair of two-dimensional droplets in pressure-driven flow through a constricted capillary tube, which is a prototype problem for the analysis of the interaction of emulsion droplets in porous media.

Here, we present simulations that illustrate the effects of various system parameters on the droplet stability. Parameters studied include the capillary number, the interfacial tension, the suspended-to-suspending-phase viscosity ratio, the valency and concentration of added electrolytes, the droplet-to-pore size ratio, the pore-body-to-throat size ratio and the type of pore geometry. Of these, the parameters that most strongly affect the coalescence behavior are the capillary number and the viscosity ratio.