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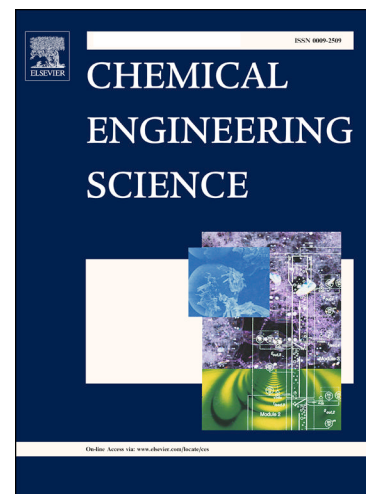
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Modeling surfactant adsorption/retention and transport through porous media

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Abstract

The mathematical modeling of adsorption/retention behavior of surface active materials in a porous medium composed of a complex network of macropores, mesopores, and micropores was studied herein. In this paper, we propose a model for these processes and discuss selecting boundary conditions for parameter fitting, analyze tracer and surfactant signal sizes, contrast calculated results of reversible and irreversible adsorption, and address the difference between local equilibrium and the rate-limited process. We used experimental data from the literature to adjust the parameters of the proposed model, taking macroporosity and mesoporosity into account. Our results show that at least two types of porosity should be used for modeling porous media. Moreover, the boundary condition at the outlet was found to significantly affect the output response. This effect is greater in systems with low Péclet numbers (high dispersion and/or diffusion, i.e., $N_{Pe} < 5$). Therefore, an appropriate boundary condition should be used if an analytical solution is employed to fit experimental parameters for the tracer. In addition, we observed that two input signal characteristics, namely slug size and rectangular pulse, proved to be of great importance in determining the output response when they are smaller than the corresponding values that would cause the system to reach adsorption saturation. A local equilibrium assumption is only valid when the flow conditions result in a Stanton number greater than

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