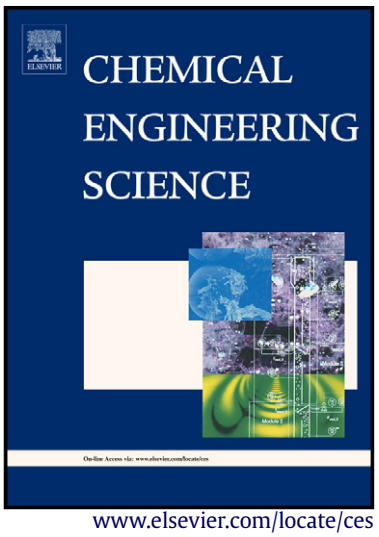

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Modeling Non-Newtonian Slurry Flow in a Flat Channel with Permeable Walls

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ABSTRACT

A model describing a shear-thinning slurry flow in a flat channel is developed. A diffusive flux modeling approach, which allows calculating particle migration to the channel center, is employed. The model developed accounts also for a fluid leak-off through permeable channel walls. Most of the calculation examples are presented for power-law slurry rheology and a few for Herschel-Bulkley slurries. An evolution of the cross-sectional solids concentration distribution along the channel is analyzed in dependence on slurry system parameters. The computations also revealed a significant effect of particle migration to the channel center on the pressure gradient. The results obtained demonstrate that the particle migration may be important for modeling particle transport in narrow flat channels and, therefore, this phenomenon must be taken into account in the modeling of technological processes, such as proppant transport in hydraulic fracturing.

Keywords: Hydraulic Fracturing, Modeling, Non-Newtonian Flow, Particle, Slurry, Transverse Migration

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