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CFD simulation for Biomagnetic Separation involving Dilute Suspensions

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Abstract: Full-Eulerian simulation of the separation of magnetic particles carried by a Newtonian fluid through a planar channel under the influence of a magnetic field is presented. The simulation is based on the application of the Navier-Stokes and concentration equations. The scheme for the magnetic separation of particles is achieved by applying an external magnetic dipole field. The hydrodynamic and magnetophoretic interactions between the particles and the carrier fluid are analysed. Analysis of the competing tendencies of mass transfer indicates that the magnetophoresis migration of magnetic particles is dominant over the molecular diffusion. This dominance becomes more evident at lower diffusivities leading to a drastic magnetic separation confined within a small region in the proximity of the magnetic field source. © 2012 Canadian Society for Chemical Engineering