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Formation of nanoscale structures through driven flow of nanoparticles in microchannels ROLF VERBERG, University of Pittsburgh, JULIA YEOMANS, Oxford University, ANNA BALAZS, University of Pittsburgh — Using a computational model, we consider an isothermal binary fluid that contains tracer particles, which are advected by the fluid within a microchannel. The flow is modeled directly using a Lattice Boltzmann algorithm for a binary fluid. We then introduce nanoparticles that travel along trajectories that obey a stochastic differential equation, such that the concentration of nanoparticles in the bulk obeys a standard convection-diffusion equation. To simulate the affinity of the nanoparticles to one of the components, we modified the stochastic diffusion equation in order to include a drift term that contains the gradient of the order parameter. Reactions with the solid boundaries will be incorporated by introducing a reaction probability when the particle's trajectory crosses the solid-fluid surface. The results provide guidelines for creating microfluidic devices with surfaces that contain well-controlled spatial patterns on the nanometer to micron range.

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