Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Using chiral structures to enhance particle deposition in microfluidic devices YUNJI GU, ZACHARY MILLS, ALEXANDER ALEXEEV, Georgia Tech — We used three dimensional computer simulations to examine the deposition of nanoparticles suspended in a fluid flowing through a microchannel that encompasses a periodic array of chiral structures. The channel was filled with a viscous fluid and tracer particles were used to simulate the suspended nanoparticles. The structures induce secondary flows in the fluid, which enhance mixing and in turn induce more rapid deposition of nanoparticles on channel walls. To model the system, we employed a lattice Boltzmann model coupled with a Brownian dynamics model. To investigate how the chiral structures influence the deposition rate, we systematically varied three parameters in the system: the pitch and radius of the chirals, and the spacing between structures in the array. Our simulations revealed that structures enhance nanoparticle deposition and the effect is more pronounced at larger Peclet numbers. Furthermore, we established the optimal geometry of the structures leading to increased particle deposition on the microchannel walls. Our findings could be useful for improving microscale sensory devices.

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Date submitted: 03 Aug 2012 Electronic form version 1.4