Abstract Submitted
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Concentration distributions of arbitrary shaped particles in microfluidic channel flows ARVIND SAIBABA, ERIC SHAQFEH, ERIC DARVE, Stanford University — We are interested in the study of the transient and steady state concentration distribution of orientable Brownian particles across channels at low Reynolds numbers. This is important in understanding margination of blood "particles" including platelets as well as new drug delivery and cancer nanotechnology particles which are involved in hemostasis as well as delivering drugs to the vascular endothelial cells. Although our formulation is general, the particles we consider are rigid Brownian "surfboards" which have been found to be effective in drug delivery since they are resistant to leukocyte attack [1]. The Stokes flow in the channel around the particles, driven by a mean pressure gradient, is computed using the Boundary Element method within the single layer formulation. The particle motion is calculated using rigid body dynamics with a contribution due to Brownian motion that satisfies the Fluctuation-Dissipation theorem. Finite concentrations are considered, and all hydrodynamic interactions are included. The concentration distribution is computed and interpreted as a balance between the concentration dependent variation in the non-equilibrium particle osmotic pressure and the cross stream particle normal stresses.

[1] J. A. Champion, S. Mitragotri, "Role of target geometry in phagocytosis", PNAS 103, 4930-4934, (2006)

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