Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Towards 2D field-flow fractionation - Vector separation over slanted open cavities JORGE A. BERNATE, MENGFEI YANG, HONG ZHAO, Stanford University, SUMEDH RISBUD, COLIN PAUL, MATTHEW DALLAS, KONSTANTINOS KONSTANTOPOULOS, Johns Hopkins University, GERMAN DRAZER, Rutgers University, ERIC S.G. SHAQFEH, Stanford University — Planar microfluidic platforms for vector chromatography, in which different species fan out in different directions and can be continuously sorted, are particularly promising for the high throughput separation of multicomponent mixtures. We carry out a computational study of the vector separation of dilute suspensions of rigid and flexible particles transported by a pressure-driven flow over an array of slanted open cavities. The numerical scheme is based on a Stokes flow boundary integral equation method. The simulations are performed in a periodic system without lateral confinement, relevant to microfluidic devices with negligible recirculation in the main channel. We study the deflection of rigid spherical particles, of flexible capsules as a model of white and red blood cells, and of rigid discoidal particles as a model of platelets. We characterize the deflection of different particles as a function of their size, shape, shear elasticity, their release position, and the geometric parameters of the channel. The simulations provide insight into the separation mechanism and allow the optimization of specific devices depending on the application. Good agreement with experiments is observed.

Jorge A. Bernate
Stanford University

Date submitted: 02 Aug 2013 Electronic form version 1.4