Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Continuous Size-Based Particle Separation in a Microfluidic Device BARUKYAH SHAPARENKO, HAN-SHENG CHUANG, HOWARD HU, HAIM BAU, University of Pennsylvania, GEORGE WORTHEN, Children's Hospital of Philadelphia — Pinched flow fractionation is a continuous particle sorting technique in which two streams (one with particles, the other without particles) are manipulated to meet and then flow collinearly through a pinched microchannel. Due to geometric constraints, the particles align at different positions relative to the channel wall, with smaller particles closer to the wall than larger particles. Following the pinched segment, the channel broadens significantly, and the differences in particle positions are amplified as the particles follow the diverging fluid streamlines and are separated into different outlet channels based on their sizes. We analyze the separation of 2 and 10 μm rigid spherical particles with a pinched segment of 40 μm width, comparing 2D computational results and experimental results. We control the separation by specifying an inlet flow rate ratio and one outlet flow rate. We optimize the channel geometry and determine the operating parameters necessary to achieve effective particle separation. Multiple stages of such separation components can be integrated for finer separations. Other separation mechanisms, like dielectrophoresis, can also be integrated into the device using field flow fractionation, in which an external field is applied perpendicular to the direction of flow, causing the particles to cross fluid streamlines.

Howard Hu
University of Pennsylvania

Date submitted: 06 Aug 2010 Electronic form version 1.4