Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Design of Micropost Array for Low Bubble Retention[1] MAHSHID MOHAMMADI, KENDRA SHARP, Oregon State University — One of the well-known problems in microfluidic systems is the presence of immobile bubbles which may disturb the performance of the device. Bubbles moving through variable cross sectional areas such as regions between microposts are prone to getting stuck in the contractions. The minimal external pressure needed to overcome the capillary pressure and drive a bubble out of a contraction is called the clogging pressure. At low flow rates the clogging pressure for a bubble moving through contractions between microposts may be much larger than the pressure drop along the length of the bubble, and the chances of bubble stagnation are high. Large bubbles which come into contact with several microposts have the highest potential for geometry-based management. With an appropriate design it is possible to restrict a large bubble between two adjacent columns of microposts and force it to elongate along the direction of the flow. In that situation the bubble experiences a larger pressure drop along its length and is more likely to overcome the resistant capillary pressure. Preventing the bubbles from taking meandering paths is a key factor for keeping bubbles in motion toward the desired destination. Based on our experimental evidence we propose a design criterion that facilitates bubble mitigation in a micropost arrangement. The criterion places geometrical constraints on longitudinal, transverse, and diagonal pitches that need to be satisfied in order to have low bubble retention characteristics in a micropost array.

[1]This work has been supported by National Institutes of Health contract number 1 R01 EB011567-01A1.

Mahshid Mohammadi
Oregon State University

Date submitted: 25 Jul 2013 Electronic form version 1.4