Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Numerical Investigation of Liquid Flow through Micro-channels with Post Patterned Super-hydrophobic Walls A. AMIN, D. MAYNES, B.W. WEBB, Brigham Young University — We numerically investigate the effect of post patterned super-hydrophobic surfaces on the drag reduction for laminar liquid flow through micro-channels. Hydrophobic surfaces exhibiting micro-scale structures can significantly reduce the liquid-solid contact area resulting in reduced surface friction. The effects of cavity fraction (the ratio of cavity area to total surface area) and relative module width (ratio of post/cavity repeating length to channel hydraulic diameter) on the slip-length and on the Darcy friction factor-Reynolds number product, *fRe*, were explored numerically for the post structured hydrophobic walls. The cavity fraction and relative module width vary from 0.5 to 0.9998 and from 0.01 to 1.5, respectively. In general, as both cavity fraction and relative module width increase *fRe* decreases. The present results are compared with those for surfaces exhibiting rib/cavity patterns that are parallel and perpendicular to the flow direction. At high cavity fractions the post/cavity structuring produces larger slip-length and greater reduction in *fRe* than either parallel or perpendicular rib/cavity structures. The results are also compared with scaling laws previously published in the literature.

Abolfazl Amin
Brigham Young University

Date submitted: 06 Aug 2009

Electronic form version 1.4