Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Fluidic resistance of confined bubbles in partial wetting regimes
SAIF A. KHAN, PRAVIEN PARTHIBAN, National University of Singapore, MICHIEL T. KREUTZER, Delft University — Understanding the fluidic resistance of moving bubbles or droplets is crucial in designing 'self-regulating' multiphase microfluidic networks. The resistance of a moving bubble lubricated by a fully wetting liquid is well understood, but its application is highly restricted to a limited number of working liquids, especially in hydrophobic materials such as PDMS that are routinely used to fabricate microfluidic networks. Here we focus our attention on flows where such complete wetting of the walls does not occur, and present a systematic analysis of the regimes that arise out of the interplay between forced wetting and dewetting. We show experimentally that small departures from complete wetting dramatically impact the fluidic resistance while the flow remains ordered and stable. We can thus predict and control the fluidic resistance of a bubble over an order of magnitude by tuning wettability. The results of this work are of significance in the design and operation of bubble train networks in microfluidic devices.

Saif A. Khan
National University of Singapore

Date submitted: 04 Aug 2008 Electronic form version 1.4