Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Asymmetric Wicking and Reduced Evaporation Time of Droplets Penetrating a Thin Double-Layered Porous Material ARIA VAHDANI, California Institute of Technology, AMIR GAT, Technion - Israel Institute of Technology, ALBERT NOWAKOWSKI, HOMAYUN NAVAZ, Kettering University, MORTEZA GHARIB, California Institute of Technology — We study numerically and experimentally the penetration and evaporation dynamics of droplets wicking into a thin double-layered porous material with order-of-magnitude difference in the physical properties (such as capillary pressure drop, porosity or permeability) between the layers. We show that such double-layered porous materials can be used to create highly asymmetrical wicking properties, preventing liquid droplets wicking from one surface to the other, while allowing for wicking in the reverse direction. In addition, these double-layered porous materials are shown to reduce the evaporation time of droplets penetrating into the porous surface, compared with a single-layered material of equal thickness and physical properties similar to either of the layers. The asymmetric wicking and reduced evaporation time demonstrated in such double-layered porous materials may be of interest to applications such as medical bandages and wearable fabrics.

Amir Gat
Technion - Israel Institute of Technology

Date submitted: 15 Jul 2013 Electronic form version 1.4