Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Thermocapillary Driven Droplet Motion on Lubricant Impregnated Textured Surfaces NADA BJELOBRK[1], Massachusetts Institute of Technology, HENRI-LOUIS GIRARD[2], Ecole Polytechnique, HYUK-MIN KWON, Massachusetts Institute of Technology, DAVID QUERE, ESPCI Paris Tech, KRIPA K. VARANASI, Massachusetts Institute of Technology — Here, we show that lubricant impregnated surfaces (LIS) promote thermocapillary induced motion of liquid droplets. The contact angle of a droplet on LIS is low, which increases the effective temperature gradient over the droplet. At the same time, the contact angle hysteresis is significantly decreased and thus the pinning is suppressed. The shear forces due to the thermocapillary effect at the free interface between the droplet and the lubricant can enhance the propulsion velocity by an order of magnitude. Hereby, two aspects are are supporting the propulsion: A lubricant/droplet pair should have a large and positive interfacial tension gradient. The lubricant should also fully encapsulate the substrate. We compare various lubricant viscosities and droplet sizes to examine the thermocapillary effect and propose a model to predict the velocity of droplets moving on LIS on a temperature gradient.

[1]equal contribution
[2]equal contribution

Nada Bjelobrk
Massachusetts Institute of Technology

Date submitted: 31 Jul 2014 Electronic form version 1.4