Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Drop spreading on under-liquid substrates: Inertial to Viscous Regimes NAGA SIVA KUMAR GUNDA, SURJYASISH MITRA, SUSHANTA MITRA, Micro & Nano-scale Transport Laboratory, Department of Mechanical Engineering, Lassonde School of Engineering, York University, Toronto, ON, Canada — Spreading of liquid drops on a substrate placed in air medium is a well understood phenomenon from the theory of minimization of surface energy. This process has been studied rigorously over the past few decades due to its wide array of applications like printing, coating, microfluidic devices as well as it presents the challenging problem of contact line dynamics. However, many applications like oil recovery, emulsions, liquid-liquid displacement in porous media, etc. warrants the need to study this phenomenon in the presence of a surrounding liquid medium. In the present study, an experimental investigation of the spreading process of a laser-oil drop on an ITO-coated glass substrate submerged inside water has been conducted. The experimental investigation reveals two different regimes of under-liquid drop spreading, one which is dominated by inertia and a later regime, where viscous effects, with contributions from both the drop and surrounding liquid, takes over. In doing so, we have identified the characteristic time scales for each regimes and also the transition point from one regime to another.

Naga Siva Kumar Gunda
Micro & Nano-scale Transport Laboratory,
Department of Mechanical Engineering, Lassonde School of Engineering,
York University, Toronto, ON, Canada

Date submitted: 25 Jul 2015 Electronic form version 1.4