

Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Oscillation-induced drop transport using low-frequency ac electrowetting¹ JIWOO HONG, SEUNG JUN LEE, KWAN HYOUNG KANG, Department of Mechanical Engineering, Pohang University of Science and Technology — When a small drop starts to move contact angle hysteresis (CAH) manifests as a pinning force and hinders the drop transport on a solid surface. For such a reason, many researchers have been studying how to reduce CAH. On the contrary, we demonstrate that small drops on an inclined plane can be mobilized by utilizing CAH and drop oscillations driven by ac electrowetting rather than reducing CAH. By using the peculiar dependence of sliding velocity on the size of a drop and the applied ac frequency, we can selectively slide drops of a specific size or merge two volumetrically different drops along an inclined plane. In addition, the direction of drop motion is determined by the initial asymmetry of contact angles on both edges of a drop. Accordingly, small drops can climb up an inclined plane using low-frequency ac electrowetting when the initial asymmetry of contact angles is reversed. We also obtain the threshold voltage for a climbing drop and the empirical relationship between the applied voltage and the climbing velocity.

¹This work was supported by the National Research Foundation of Korea (NRF) grant No.R0A-2007-000-20098-0 funded by the Korea government (MEST) and No. 20090083510 through Multi-phenomena CFD Engineering Research Center.

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Date submitted: 09 Aug 2012

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