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Hydrodynamics and Heat Transfer of Discrete Droplets in Microfluidic Devices ROBERT WEBER, SHERVIN SHAJIEE, KAMRAN MOHSENI, University of Colorado at Boulder — Electrostatic manipulation of surfaces tension forces is now a standard fluid handling technique in microfluidic devices. In this investigation electrowetting on dielectric (EWOD) is employed in order to use discrete droplets for thermal management of compact micro systems. Both hydro- and thermodynamics of digitized droplets are investigated by experimental, theoretical and computational means. EWOD devices have been built on silicon substrates with highly doped layers replacing metal electrodes, and higher quality thermal oxides replacing the more expensive PECVD oxides. In parallel, an experimental test rig has been built to measure the heat transfer rate of the slug flow at a macro scale. Droplets at several length and speed are created systematically. Average heat transfer rates and Nusselt numbers in constant heat flux in a tube has been experimentally measured for continuous and discrete water flow cases and the results have been compared with numerical results.

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