

Abstract Submitted  
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**Discrete Droplet Microfluidics for Biological Assays** A. KALRA, F.W. Olin College of Engineering, R. MIRAGHAIE, A. NADIM, J.D. STERLING, Keck Graduate Institute — The use of droplet microfluidics to miniaturize biological assays has the potential to achieve high throughputs with small volumes of reagents. We control the discrete movement of microliter volume droplets containing DNA molecules on a surface by exploiting electrowetting, which refers to the reduction in contact angle of a liquid drop when the surface is electrically charged. A droplet containing molecular beacon is actuated and coalesced with a droplet containing complementary DNA. The hybridization is implemented on an electrowetting chip and detected using fluorescence microscopy. Electrowetting is also applied to conduct an isothermal DNA amplification reaction used for rapid detection of biological agents. A droplet containing the DNA sequence to be amplified is actuated and merged with a droplet containing enzymes, template DNA and an intercalating fluorescent dye on a heated electrowetting chip. Our chips can be activated by relatively low electrical potentials and consume little power. Time histories of the detected fluorescence intensities of the mixed reagents are presented for several hybridization and amplification reactions.

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