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Electrowetting Behavior and Digital Microfluidic Applications of Fluorescent, Polymer-Encapsulated Quantum Dot Nanofluids

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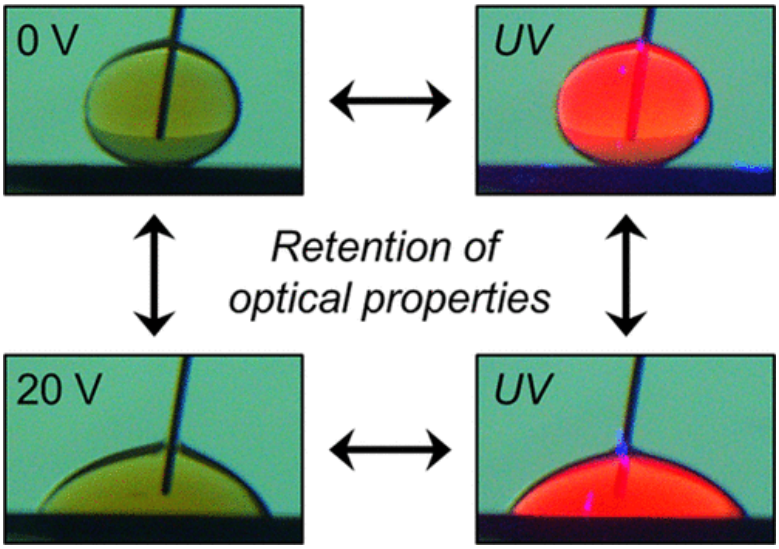
Abstract



Digital microfluidics is a liquid-handling technology capable of rapidly and autonomously controlling multiple discrete droplets across an array of electrodes and has seen continual growth in the fields of chemistry, biology, and optics. This technology is enabled by rapidly switching the wettability of a surface through the application of an electric field: a phenomenon known as electrowetting-on-dielectric. The results reported here elucidate the wetting behavior of fluorescent quantum dot nanofluids by varying the aqueous-solubilizing polymers, changing the size of the nanocrystals, and the addition of surfactants. Nanofluid droplets were demonstrated to have very large changes in contact angle (>100°) by employing alternating current voltage to aqueous droplets within a dodecane medium. The stability of quantum dot nanofluids is also evaluated within a digital microfluidics platform, and the optical properties are not perturbed even under high voltages (250 V). Multiple fluorescent droplets with varying emission can be simultaneously actuated and rapidly mixed (<10 s) to generate a new nanofluid with optical properties different from the parent solutions.

KEYWORDS: quantum dots, electrowetting, digital microfluidics, optoelectronics, colloids, interfaces

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- Four-droplet movement (AVI)
- Rapid mixing of droplets (AVI)

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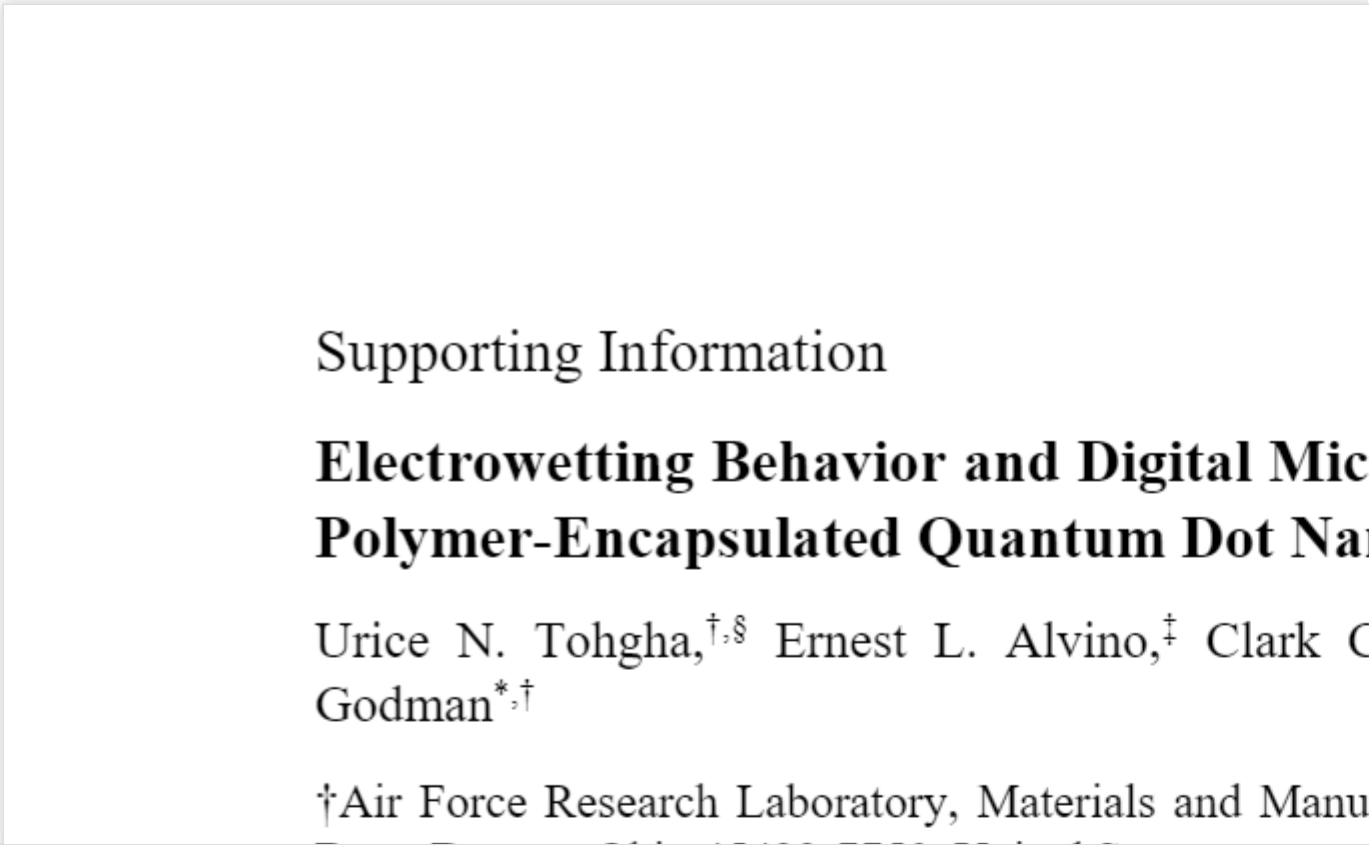

Supporting Information

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Polymer-Encapsulated Quantum Dot Na

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