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# Tuning the electrowetting behavior of quantum dot nanofluids

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## Abstract

### Hypothesis

The electrowetting behavior of droplets can be altered by the inclusion of salts, surfactants, or nanoparticles. We propose that varying the properties of cadmium selenide/zinc sulfide quantum dots will affect the electrowetting behavior of fluorescent nanofluids. Information gathered will allow for greater control of fluid properties when designing a colloidal system in an electrowetting environment.

### Experiments

Aqueous-based quantum dots were functionalized with mercaptocarboxylic acid ligands of various chain length and binding motifs by a room temperature phase transfer method. The size and concentration of the quantum dot were varied, and droplets of the resulting

exposed to increasing amounts of voltage. The change in contact angle was evaluated and correlated to the surface chemistry, size, and concentration of the quantum dots.

## Findings

Quantum dot nanofluids with longer alkyl chains have the most pronounced change in contact angle and were the most stable under applied voltage. The size of the nanoparticles does not significantly impact the electrowetting behavior at low concentration (3 μM), but nanofluids containing smaller diameter quantum dots show enhanced electrowetting behavior at higher concentration (27 μM). The fluorescent properties of the QD nanofluids studied were not affected after repeated electrowetting cycles.

## Graphical abstract


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## Keywords

Quantum Dots; Electrowetting; Interfacial Surface Tension; Colloids; Nanofluids

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