Condensed Matter Physics Seminar
Department of Physics, National Taiwan University

Liquid Manipulations on an Electro-Microfluidic Platform

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Dept. of Physics / Center for Condensed Matter
National Taiwan University

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All Are Welcome!

Abstract

Manipulating liquids and particles therein is an essential task in microfluidics. Among all the manipulations, the electric means is a promising one with the features of compact system size, simple device fabrication and packaging because external liquid pumps and physical microchannels are not necessary. In this presentation, two important electric manipulations are introduced, including electrowetting-on-dielectric (EWOD) and dielectrophoresis (DEP). On the one hand, EWOD efficiently varies the contact angle of aqueous droplets or droplets with sufficient conductivity/permittivity by voltage application across a dielectric layer between an electrode and the liquid droplet. It has been widely studied in droplet actuations for the applications of droplet-based lab-on-a-chip, liquid lenses, and displays. On the other hand, DEP drives polarizable particles suspended in a liquid medium by non-uniform electric fields as well as pumps liquids with a high permittivity toward the high electric field regions with a low permittivity. Based on the integration of EWOD and DEP, we have recently developed several functions demonstrating that the electric manipulations are general for microfluidics. In the presented devices, electric manipulations would be applied to (1) objects on different scales (droplets and particles), (2) droplets with different conductivities (water and oil droplets), and (3) liquids in different formations (discrete droplets and continuous virtual microchannels).

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