2D-Actuation of a Water droplet by using ECOD (Electrical Charging of Droplet)

정용미, 강인석*
POSTECH
(iskang@postech.ac.kr*)

The precision manipulation of droplets in microfluidic devices is enabling the development of high-throughput reactors that use minute quantities of reagents. As a tool for manipulating droplets individually in two-dimensional plane, we consider a conducting droplet charged by ECOD (electrical charging of droplet). By combining electrostatic charge on the droplet and electric field on the device, it is provided fine control over individual droplet-microreactors while retaining high purity due to less contamination on the device. In this work, for feasibility of 2D-actuation of a charged droplet, we use several Relays and Lab-View™ program to sequentially incorporate electric fields by bare copper electrodes (3×3 array) on the flat surface of Teflon plate. The velocity and direction of a droplet are manipulated by the strength and on-off control of the electric field. From experiment result, the droplet is two-dimensionally actuated by following the direction of the electrical field signal and the rapidity of this is dependant on the strength of the electric field. The electrical conductivity of the droplet and the viscosity of the medium fluid are also key factors of droplet actuation.