

Abstract Submitted  
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**Digitally controlled droplet microfluidic system based on electrophoretic actuation**<sup>1</sup> DO JIN IM, BYEONG SUN YOO, MYUNG MO AHN, DUSTIN MOON, IN SEOK KANG, Pohang University of Science and Technology (POSTECH) — Most researches on direct charging and the subsequent manipulation of a charged droplet were focused on an on-demand sorting in microchannel where carrier fluid transports droplets. Only recently, an individual actuation of a droplet without microchannel and carrier fluid was tried. However, in the previous work, the system size was too large and the actuation voltage was too high (1.5 kV), which limits the applicability of the technology to mobile use. Therefore, in the current research, we have developed a miniaturized digital microfluidic system based on the electrophoresis of a charged droplet (ECD). By using a pin header socket for an array of electrodes, much smaller microfluidic system can be made from simple fabrication process with low cost. A full two dimensional manipulation (0.4 cm/s) of a droplet (300 nL) suspended in silicone oil (6 cSt) and multiple droplet actuation have been performed with reasonable actuation voltage (300 V). By multiple droplet actuation and coalescence, a practical biochemical application also has been demonstrated. We hope the current droplet manipulation method (ECD) can be a good alternative or complimentary technology to the conventional ones and therefore contributes to the development of droplet microfluidics.

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