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Electrophoresis of a charged electrolyte droplet[1] DO JIN IM, JI-HOON NOH, IN SEOK KANG, POSTECH — We study the motion of a charged droplet in a dielectric fluid under electric field for the use as a microdroplet actuation method. The amount of electrical charging has been measured experimentally for a water droplet and an electrolyte droplet using the Stokes law. Comparison is made with theoretical value of a perfect conductor sphere. The effects of droplet size, electric field strength, and electrolyte concentration on the motion of aqueous droplet are investigated. A scaling law derived from experimental results shows that the amount of charging of de-ionized water droplet is proportional to the square of droplet radius and to electric field strength. This means de-ionized water droplet follows well the scaling law of perfect conductor. However, the electric charging characteristic of electrolyte droplet depends on electrolyte concentration and electric field strength. But, under sufficiently high electric field, electrolyte droplet behaves like perfect conductor regardless of its concentration. This fact implies that the same actuation speed can be obtained independent of electrolyte concentration under high electric field. This property may be utilized for stable actuation of electrolyte droplets.

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Do Jin Im
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