

Charging behavior and electrochemical effect of electrolytes on droplet contact charging phenomena

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A droplet contact charging phenomenon has been studied as novel microfluidics research subject. However, the fundamental charge transfer mechanism of this interesting phenomenon is still illusive. Most of all, effects of electrolyte ions on the droplet contact charging phenomenon and related electrochemical mechanisms are not studied well. In this work, we investigate the effects of electrolytes on the droplet contact charging using four different electrolytes as a discrete aqueous phase. Precise charge measurements and analysis were performed under various voltages and electrolyte concentrations. For more accurate charge measurements, special experimental setups (Two power sources, Faraday cage, etc) were designed and performed. These experimental setups will exclude electrostatic effects existing in our system. Throughout these systematic studies, we have investigated the effects of electrolytes species and concentration on droplet contact charging more rigorously. Especially, for some specific electrolytes (NaI) with certain concentration range, the electrolyte droplet shows retreating behavior, which was not observed in the previous aqueous droplet experiments. The results provide fundamental understanding about droplet contact charging in electrochemical aspects.