Charging and Levitation of Small Particles by Mesh Electrode

Mizuki Shoyama, Shuji Matsusaka
Kyoto University, Japan
e-mail: mzk@cheme.kyoto-u.ac.jp

***Abstract*—A high-intensity electric field of parallel electrodes enables particles to charge and levitate in the absence of mechanical or fluid dynamic forces. The charged particles generally oscillate between parallel electrodes to which DC voltage is applied. This occurs because during the induction charging between particles and an electrode, the polarity of the charged particles changes. In the present research, unipolarly charged particles were separated by a method in which the upper electrode was replaced with a mesh electrode, and DC voltage was applied to the parallel electrodes. A high-speed microscope camera was used to capture the motion of the levitating particles. The particle charges were obtained from a theoretical analysis of particle motion in the electric field. In addition, the electric field around the mesh electrode was obtained from a numerical calculation, and the particle motion was additionally simulated. The experimental and simulated results showed that although unipolarly charged particles partially contact the mesh electrode and charge to the opposite polarity, many unipolarly charged particles can be separated using the mesh electrode under proper electric field conditions.**