Numerical Analysis of Self-Assembly of Nano-Particles under Electric Field

차효숙, 강인석*, 임도진
포항공과대학교 화학공학과
(iskang@vision.postech.ac.kr*)

Recent experimental observations about deposition of colloidal particles near the electrodes present the possibilities of making ordered micro or nano-sized structures. The assembly of colloidal particles has the great promise to the miniaturization of photonic and electronic circuits, their stacking, and to the production of microwires, electronic microchips and micro-biosensors and so on. In recent years, many models have been suggested to explain colloidal particle clustering. Our objective is to explain the mechanism of this phenomenon by studying the system numerically. We simulated the particle clustering in two dimensional rectangular system. Our model is based on the electroosmosis about the negatively charged, nonconducting particles near the electrodes. We obtained the electric potential by solving Poisson-Boltzmann equation and the flow field by the stream function-vorticity method. By calculating all the forces acting on the particles, we have shown the particle clustering occurs in the vicinity of the electrodes. The results suggest that electroosmosis is the main driving force for particle clustering.