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Control of Ion and Colloid Transport in Confined Systems

By Dr. Sangwoo Shin

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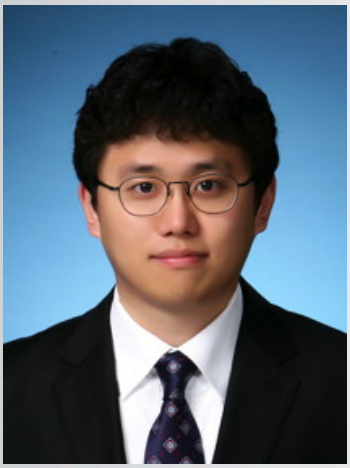

ABSTRACT

Transport of ions and colloidal particles in a confined geometry holds great interest in widespread applications as they appear in many natural and artificial systems. In the first section of this talk, we will discuss about transport and control of ions in nanoscale pores for electrodeposition of nanowires. The growth of nanowires using this technology is intrinsically unstable, which presents a major challenge for energy applications especially in thermoelectrics and electrochemical storage systems. We show that the dynamics of this process is diffusion-limited, which results in morphological growth instabilities. With such findings, we demonstrate a method to control the growth instability by spatially varying the diffusion of ions using temperature gradient. In the second part, we will discuss about colloid transport in microscale pores with a dead-end geometry, which can be found in many biological systems such as glands and follicles. Since pressure-driven fluid flow is impossible to achieve in such geometries, Brownian motion can be thought as the sole mechanism that enables the colloidal particles to go into the pore, which is extremely inefficient for microsized particles. We explore the possibility of diffusiophoresis as a means to enhance the transport of colloidal particles by introducing a solute concentration gradient along the pores.

BIOGRAPHY

Sangwoo Shin received his B.S. and Ph.D. in Mechanical Engineering from Yonsei University in 2005 and 2012, respectively. Since 2013, he has been working with Prof. Howard Stone as a Postdoctoral Research Associate at Princeton University. His primary research interest lies in the field of energy transport and conversion in small-scale systems.

EVENT DETAILS

DATE:
Wednesday,
March 11, 2015

TIME:
1:00 PM

LOCATION:
Carnegie 315
Stevens Institute of Technology

ATTENDANCE:
Public