

Fundamental Understanding of Nanofluidic Transport and Its Emerging Applications in Ionic Circuit, Clean Energy and Single Nanoparticle Sensing

Li-Hsien Yeh

Department of Chemical Engineering
National Taiwan University of Science and Technology
Email: lhych@mail.ntust.edu.tw

Abstract

With recent advance in nanofabrication techniques, nanofluidics, nanopores and nanochannels, has received growing scientific interest due to its emerging applications ranging from energy and biosensing fields. In nanofluidic systems, the electric double layer (EDL) overlap effect is generally significant, thus yielding several unique transport phenomena that could not be observed in microfluidic systems. Furthermore, the newly found ion transport phenomena, which contradict our previous understanding, are able to renew the context of next-generation nanofluidic applications. In this talk, I will first introduce what is the major difference between microfluidics and nanofluidics, followed by a brief introduction of the fascinating ion transport phenomena that generally can be found in nanofluidics such as ion selectivity, ion concentration polarization (ICP), and ion current rectification (ICR). Then I will present our recent advances with nanopores and nanochannels in the emerging fields of ionic circuit, clean energy and single nanoparticle sensing. To understand the underlying physics behind our newly discovered phenomena in experiments, theoretical modeling will be presented as well.