

Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

The capacitance of ionic liquid electric double layer near nanostructured electrodes¹ YUN SUNG PARK, MYUNG MO AHN, IN SEOK KANG, Pohang Univ of Sci & Tech — The electric double layer capacitors (EDLC) with nanostructured electrodes have attracted much attention of researchers due to their high power density and long life time. Recently, the ionic liquids are used as an electrolyte of EDLC owing to their electrochemical stability. When ionic liquids are used as an electrolyte, the interrelations between the electric double layer of ionic liquids and the nanostructured electrode must be studied. In this study, the EDLC systems with nanostructured electrodes and ionic liquids are simulated by solving the modified Poisson-Boltzmann equation proposed by Bazant, Storey, and Kornyshev (Phys. Rev. Lett. **106**, 046102 (2011)) with COMSOL Multiphysics. Several electrode geometries including exohedral, endohedral and arrayed shapes with different length scales are simulated. The potential and charge distributions in the normal direction to the electrode surface are analyzed. The capacitance per unit area is obtained and compared to that of flat electrode. The structure determines the space for counter-ion packing and co-ion gathering, thus has crucial effects on electric double layer capacitance. The critical increase of capacitance with nanoscale confined space is observed with low electrode potential.

¹This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Science, ICT and Future Planning (Grant Number: 2013R1A1A2011956).

Yun Sung Park
Pohang Univ of Sci & Tech

Date submitted: 29 Jul 2015

Electronic form version 1.4