

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Depth profile of halide anions under highly charged biological membrane WOONGMO SUNG, Department of Physics, Sogang University, WEN-JIE WANG, Ames National Lab., JONGGWAN LEE, Department of Physics, Sogang University, DAVID VAKNIN, Ames National Lab., DOSEOK KIM, Department of Physics, Sogang University — Halide ion (Cl^- and I^-) distribution under a cationic Langmuir monolayer consisting of 1,2-dipalmitoyl-3 trimethylammonium-propane (DPTAP) molecules was investigated by vibrational sum-frequency generation (VSFG) and X-ray spectroscopy. From VSFG spectra, it was observed that large halide anions (I^-) screen surface charge more efficiently so that interfacial water alignment becomes more randomized. On the other hand, number density of ions directly measured by X-ray fluorescence spectroscopy at grazing incidence angle reveals that the ion densities within $6 \sim 8$ nm are the same for both I^- and Cl^- . Since the observed ion densities in both cases are almost equal to the charge density of the DPTAP monolayer, we propose that larger halide anions are attracted closer to the surface making direct binding with the charged headgroups of the molecules in the monolayer, accomplishing charge neutrality in short distance. This direct adsorption of anions also disturbs the monolayer structure both in terms of the conformation of alkyl chains and the vertical configuration of the monolayer, with iodine having the stronger effect. Our study shows that the length scale that ions neutralize a charged interface varies significantly and specifically even between monovalent ions.

Doseok Kim
Sogang Univ

Date submitted: 11 Nov 2014

Electronic form version 1.4