Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Real-Time Optical Observation of Water Diffusion at a Graphene-Silica Janus Interface SUNMIN RYU, DAEEUNG LEE, GWANGHYUN AHN, Kyung Hee Univ - Suwon Campus — Because of the dominant role of the surface of molecules and their individuality, molecules behave distinctively in a confined space, which has far-reaching implications in many physical, chemical and biological systems. Here, we demonstrate that graphene forms a unique atom-thick interstitial space that enables the study of molecular diffusion in 2-dimensions with underlying silica substrates. Raman spectroscopy visualized intercalation of water from the edge to the center underneath graphene in real time, which was dictated by the hydrophilicity of the substrates. In addition, graphene undergoes reversible deformation to conform to intercalating water clusters or islands. Atomic force microscopy confirmed that the interfacial water layer is clearly flat and only a few angstroms thick, corresponding to one bilayer unit of normal ice. This study also proves that oxygen species responsible for the ubiquitous hole doping are located below graphene. In addition to serving as a transparent confining wall, graphene and possibly other 2-dimensional materials can be used as an optical indicator sensitive to interfacial mass transport and charge transfer.

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Date submitted: 11 Nov 2013 Electronic form version 1.4