Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Dehydration as a Universal Mechanism for Ion Selectivity in Graphene and Other Atomically Thin Pores[1] SUBIN SAHU, NIST - Natl Inst of Stds Tech , MASSIMILIANO DI VENTRA, Department of Physics, University of California, San Diego, MICHAEL ZWOLAK, NIST - Natl Inst of Stds Tech — Ion channels play a critical role in regulating cell behavior and in electrical signaling. In these settings, polar and charged functional groups – as well as protein response – give rise to ion selective transport, allowing the channels to perform specific tasks in the operation of cells. According to recent experiments, graphene nanopores can have both weak to strong selectivity, the origin of which is unclear. Here, we establish that graphene displays an alternative, novel mechanism for selectivity: Dehydration – the most fundamental physical process in ion transport – yields selective pores without the presence of charges or structural changes of the pore. This fundamental mechanism – one that depends only on the geometry and hydration – is the starting point for selectivity for all channels and pores. Its likely detection in graphene pores resolves the conflicting selectivity results, as well as opens up a new paradigm for engineering molecular/ionic selectivity in filtration and other applications.

[1]S. Sahu acknowledges support by UMD/CNST Cooperative Research Agreement, Award 70NANB10H193 through University of Maryland

Subin Sahu
NIST - Natl Inst of Stds
Tech

Date submitted: 10 Nov 2016 Electronic form version 1.4