Abstract Submitted
for the FWS14 Meeting of
The American Physical Society

Hydrophobic Gating in Single Conically Shaped Nanopores[1]

WILLIAM MANN, DIEGO GUTIERREZ, California State University, Long Beach, LAURA INNES, ZUZANNA SIWY, University of California, Irvine — Voltage-gated biological channels are understood to use hydrophobic interactions in their gating mechanism. To better understand how these interactions control ionic transport, mimics were created using single conical nanopores in 12 μm thick polyethelene terephthalate (PET) films. Pores were prepared by the track-etching technique; single ion irradiated foils were subjected to asymmetric wet-chemical etching. The pores used had a narrow opening between 3 and 11 nm, and a big opening $\sim$500 nm. This study investigates the ion transport properties of nanopores, modified with decylamine to render the PET surface hydrophobic. Modification was verified by current-voltage (I-V) curves of the pore before after attachment of decylamines. Hydrophobic pores often exhibit hydrophobic gating i.e. there is a voltage range for which there is no measurable ion current. In our experiments voltages of few hundred mV had to be applied to see finite ionic transport. The closed state of the pore is believed to correspond to a pore being filled with water vapor; a conducting indicates condensed water. Hydrophobic gating is also characterized by hysteresis: the voltage magnitude needed to open the pore for ionic current is larger than that for which the pore closes.

[1]This project is supported in part by the National Science Foundation and the Department of Energy.

William Mann
California State University, Long Beach

Date submitted: 17 Oct 2014 Electronic form version 1.4