Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Electrolyte gating and the charge sensitivity measurements on Si nanowire transistors JIWOONG PARK, YEONGHWAN AHN, JAMES DUNNING, The Rowland Institute at Harvard — Nanoscale semiconductors can be used as a sensitive charge detector in water because their electrical conductance is strongly affected by the local charge distribution. Here we report conductance measurements on a charge sensor fabricated using individual Si nanowires (SiNWs) with a typical diameter of 20 nm in aqueous environment. First, the conductance of SiNWs was measured with an electrolyte gate. They show good sensor characteristics such as a large transconductance, subthreshold voltage swing and a much reduced noise level. Then a lipid bilayer membrane with different electrical charges and fluorescent dyes were deposited onto the device and manipulated using electric fields and fluorescence quenching while the SiNW conductance was monitored. The DC and AC conductance of SiNWs displays systematic changes according to the polarity and density of electrical charges on the membrane. The sensitivity and temporal resolution of SiNW sensors can be quantitatively decided based on this result.

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Date submitted: 01 Dec 2004 Electronic form version 1.4