

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

InAs Nanowire Transistors as Gas Sensor: the Role of Surface States¹ DONG LIANG, JUAN DU, HAO TANG, XUAN P.A. GAO, Department of Physics, Case Western Reserve University — Utilizing the large surface-to-volume ratio, sensors of quasi one-dimensional semiconductor nanowires based electronic devices have been shown high sensitivity to the adsorption gaseous molecules or the binding of biomolecules in liquid, enabling a label-free sensing modality with high sensitivity and direct electrical readout. We report a study of the response of InAs nanowire field-effect transistor sensor devices to various gases and alcoholic vapors. It is concluded that the change in conductance of the device in response to chemical vapors is a combined result of both the charge transfer and modified electron mobility effects. In particular, we found that surface adsorption of most chemical molecules can reduce electron density in nanowires from $\sim 10^4$ to $\sim 10^3/\mu\text{m}$ and enhance the electron mobility greatly (from tens to a few hundred of $\text{cm}^2/(\text{V s})$) at the same time. These effects are attributed to the interactions between adsorbed molecules and the electron accumulation layer and rich surface states on the InAs nanowire surface. Journal reference: Nano Letters 9, 4348 (2009).

¹Supported by ACS PRF #48800-DNI10.

Dong Liang
Department of Physics, Case Western Reserve University

Date submitted: 23 Nov 2010

Electronic form version 1.4