Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Origin of Capacitance Change in Semiconducting and Metallic Carbon Nanotubes SEONG CHU LIM, DINH LOC DUONG, YOUNG WOO JO, TAE HYUNG KIM, SOO MIN KIM, Department of Energy Science, Sungkyunkwan University, JUNG HYUN YOON, HA RYONG HWANG, WISE CONTROL Inc., R&D Division, SLAVA ROTKIN, Department of Physics, Lehigh University, YOUNG HEE LEE, Department of Energy Science, Sungkyunkwan University, WISE CONTROL INC., R&D DIVISION COLLABORATION, DEPARTMENT OF PHYSICS, LEHIGH UNIVERSITY COLLABORATION — Different mechanisms are reported for the capacitance changes in metallic (m-) and semiconducting (s-) single-walled carbon nanotubes (SWCNTs) upon gas adsorption. The sensitivity, i.e., the change in capacitance, was high and reached approximately 2500% in the aligned s-SWCNT network, whereas the sensitivity was found to be low in the m-SWCNT network. The charge transfer/Fermi level shift and quantum capacitance related to the localized electronic density of states near the Fermi level were key contributors to sensitivity changes upon gas adsorption, although the polarization effect also played a role in the capacitance changes, particularly in the aligned CNTs, under a strong electric field.

Seong Chu Lim
Department of Energy Science, Sungkyunkwan University

Date submitted: 15 Nov 2011 Electronic form version 1.4