Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Directed Linking of Carbon Nanotubes with CdSe Quantum Dots and Au Nanoparticles KATHRYN LEACH, TODD KRAUSS, University of Rochester — As circuit miniaturization continues, the demand for smaller and more efficient component parts has increased. Metallic single-walled carbon nanotubes (SWNTs) are the ideal nanometer-scale wire, as they can withstand current densities up to 2 to 3 orders of magnitude higher than copper currently used in electronic chips. These conductive nanotubes can therefore be utilized as "nano-electrodes" to efficiently electrically contact another nanoscale object, such as a single semiconductor quantum dot (QD) or metallic nanoparticle (NP), thus creating macroscopic integrated systems based on nanometer-scale components. Although NPs have been previously attached to NTs, the attachment scheme was uncontrolled; direct and defined attachment of NPs to SWNTs remains elusive. We have designed a strategy for directed assembly of fabricated QD–SWNT devices. NTs were grown across patterned catalyst islands on a silicon wafer followed by electrode placement. After cutting the NTs, the resulting carboxylic group moieties found at the cut NT edges were used to covalently attach CdSe QDs or Au NPs. Electrostatic force microscopy (EFM) and transport measurements were used to monitor NT conductivity before and after cutting, as well as after NP attachment. The photoelectrical transport properties of a typical hybrid QD–SWNT device will be discussed.

Kathryn Leach
University of Rochester

Date submitted: 16 Nov 2006 Electronic form version 1.4