Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Modeling of Au Nanoparticles and Semiconductor Nanowires for Nanodevice Applications[1] A. MAKEPEACE, J.M. YARRISON-RICE, Miami University of Ohio, P. KUMAR, M. FICKENSCHER, L.M. SMITH, H.E. JACKSON, University of Cincinnati, Y.-J CHOI, G.-J. PARK, Korea Institute of Science and Technology, C. JAGADISH, The Australian National University — Semiconductor nanowires with and without plasmon enhancement are being studied for nanodevice applications ranging from chemical sensors to medical monitors and photovoltaics. Semiconductor nanowires can incorporate materials with different bandgaps and can be p- or n-doped. Growths come in different morphologies and geometries (bare, axial or radial heterostructures); all of which expands the design parameters for photocurrent based devices. When Au nanoparticles are attached to nanowires, the local electric field can be enhanced by orders of magnitude, thus increasing their absorption and photocurrent. Using an FDTD Maxwell solver, we simulate local electric fields and absorption characteristics of semiconductor nanowires and Au nanoparticles. We report on spherical, cylindrical and bipyramidal Au nanoparticles with local electric field enhancements that increase with nanoparticle asymmetry and sharp features. The Au nanoparticle modeling data is also in good agreement with experimental absorption data. Initial investigations of 275 nm InP nanowires exhibit internal mode structure under illumination with both polarizations, and absorption coefficients as a function of wavelength. These results provide insight into our experimental investigations of nanowire device applications.

[1]Financial support through NSF DMR grants 0806572 and 1105121.

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Date submitted: 09 Nov 2012

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