

**2011 Materials Research Society Fall Meeting
November 28 – December 2, 201,
Boston Massachusetts USA**

SESSION J7: Photonic and Plasmonic Materials for Enhanced Photovoltaic Performance

Chairs: Kylie Catchpole and Hernan Miguez

Wednesday Evening, November 30, 2011

8:00 PM

Exhibition Hall D (Hynes)

8:00 PM J7.50

Device Analysis of Planar and Vertical Nanocoaxial Solar Cells Timothy Kirkpatrick,
Michael Burns and Michael J. Naughton; Physics, Boston College, Chestnut Hill, Massachusetts.

Analytical expressions for device transport are calculated for an array of vertically aligned nanocoaxial solar cells, and compared to that of a planar solar cell. Beginning with a canonical derivation for the total current of a PIN solar cell, in both planar and cylindrical geometries, expressions for rectifying current behavior are subsequently derived and analyzed. Fundamental differences in the physics of cell performance are inferred based on the analytical solutions for each geometrical structure. Key differences of importance are the differential equations governing minority carrier concentration in the device and the functional dependence of the dark and short circuit current on analogous physical parameters in each corresponding geometry. Finally, a comparison between planar and nanocoaxial device performance for an amorphous silicon PIN solar cell is analyzed numerically, and an attempt at optimizing cell efficiency in the nanocoaxial structure is performed.