Engineering/Physics/Materials Science/Technology Seminar Series!!

Dr. Vijay P. Singh,

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Title:

"Nanowire Device Designs for Solar Cell Applications"

Abstract:

Nanostructured Semiconductor materials, including films and nanowires (NWs) have recently received a great deal of attention due to their advantageous electro-optical characteristics. The possibility of controlling these properties by varying the particle size, shape and surface properties is of great interest for nanoscale device applications in microelectronics and optoelectronics. In particular, nanostructured solar cells offer two advantages (i) size dependent quantum confinement driven enhancement of the effective energy band gap in inorganic semiconductors and (ii) A short path (few nm) to hetero-interfaces where excitons can split into electrons and holes resulting in higher short-circuit currents and higher efficiencies in organic semiconductor solar cells. Copper indium diselenide (CIS), a p-type semiconductor with direct band gap of about 1 eV is a leading absorber material for commercial thin-film photovoltaics. Templates assisted synthesis of CIS nanowires will allow us to overcome the intrinsic nature of CIS to grow into larger grains. To this end, nanowires of inorganic semiconductor Copper indium diselenide ($CuInSe_2$) and organic semiconductor (CuPc) were fabricated by electrodeposition in nanoporous alumina templates. Al-CuPc nanowire, Al-CIS nanowire Schottky diode solar cells were fabricated. The devices were characterized by XRD, SEM, UV-Vis absorption and electro-optical measurements. These results will be presented.

Bio:

Education: B. Tech (EE), 1968, IIT, Delhi; M.S. (EE), 1970, and Ph.D. (EE), 1974, both from University of Minnesota, Minneapolis.

Field of Research: Thin Film Solar Cells; Nanoelectronic Devices; Organic Semiconductors; Sensors. Electroluminescent Displays; Optoelectronics ; Flat-Panel Displays; Electronic Materials; Thin-film Technology; and Propagation Delays in Integrated Circuits and Packages; Multi-Chip Modules; High Speed Electron Devices.

Dr. Singh has published extensively in respected journals and holds multiple patents. He began his academic career at UTEP, El Paso in 1983 where he also served as Associate Dean of Engineering from 1997-99. Then he moved to U of KY, Lexington, KY in 2000 as Chair of EE department. Before beginning his academic career he worked in industrial R&D and was instrumental in starting a new company called Photon Energy Inc. in 1982. The principal line of business of this company was design, development and production of new generation of solar cells. The company was later sold to Golden Photon Inc, a subsidiary of Coors.

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