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Seminar

Materials Science & Engineering

Presents:

Elizabeth Lund

Ph.D. Student, Chemical Engineering

“Plasmonic Nanosphere Enhanced Thin Film Si Solar Cells”

Plasmonic nanoparticles deposited on optically-thin photovoltaic cells are emerging as a viable option for increasing efficiency. The surface plasmon resonances induced by incident electromagnetic waves forward scatter light preferentially into the cell absorber material, thereby increasing the photogeneration of electron-hole pairs. This project aims to investigate the viability of gold nanospheres in increasing the efficiency of thin film silicon solar cells. Si solar cells have been obtained from NREL (National Renewable Energy Resources Laboratory) and consist of 60 nm ITO (indium tin oxide), gold nanorods, 15 nm ITO, 15 nm p⁺ hydrogenated amorphous silicon (a-Si), 3 nm intrinsic hydrogenated a-Si, 2 μm epitaxially deposited crystalline silicon (c-Si), an electronically dead n⁺ c-Si wafer, and a metal back contact. The external quantum efficiency of this cell peaks around 600 nm, with poor absorption above ~700 nm. Gold nanospheres 40 and 60 nm in diameter are randomly distributed on the surface of the ITO via hydrogen bonding between a covalently bonded monolayer of (3-aminopropyl)triethoxysilane (APS) on the ITO and the carboxylic acid functionality on the nanoparticle surface. Characterization tests of reflectivity, resistance, SEM images, and photocurrent generation will be discussed.

Wednesday November 4, 2009

4:10-5:00 p.m.

1230 WEB