NANOHOUR

Wednesday, May 6, 2009 3:00 pm
Beckman Institute - Room 3269

Enhanced Light Harvesting Efficiency of Dye Sensitized Solar Cells Coupled to Photonic Crystals

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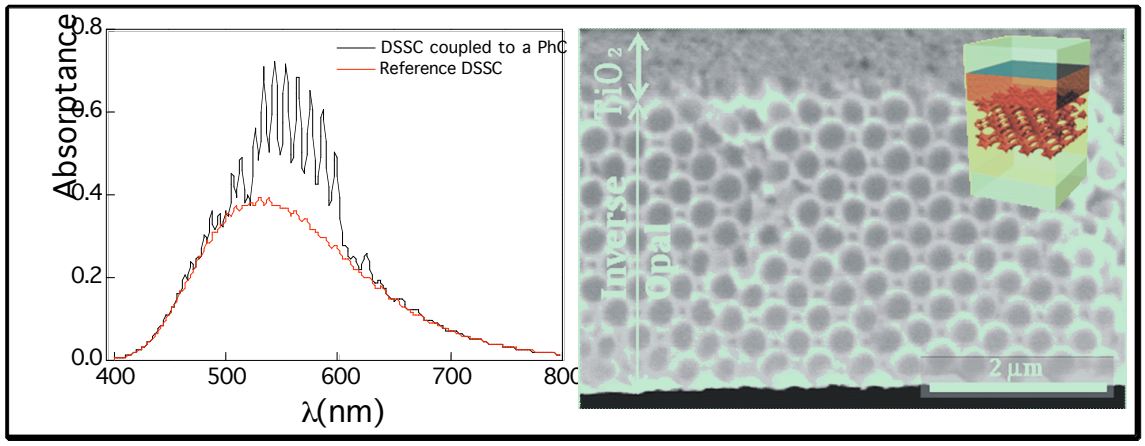

Nanocrystalline dye-sensitized solar cells (DSSC) have been shown to be promising alternatives to the more efficient but expensive silicon solar cells. DSSC are composed of a working electrode, typically a 5-10 μm thick film of nanocrystalline titania, sensitized with a visible absorbing dye, a liquid-iodide based electrolyte that fills the interstitial space, and a platinized counterelectrode. DSSCs have achieved record efficiencies of around 11% and have technical advantages or added value such as ease of fabrication, low cost, and transparency.

In this presentation, I will describe how photonic crystals, materials with a periodical arrangement of the dielectric constant, can be employed within DSSC to enhance light harvesting efficiency when placed after the absorbing electrode, being porous enough to let the electrolyte reach the organic dye and keeping the transparency and ease of fabrication that characterize these solar cells. The light harvesting enhancement observed when photonic colloidal crystals are integrated in dye sensitized titanium oxide solar cells will be investigated. Such absorptance increment will be explained in terms of slow photon propagation at certain ranges of wavelengths lying within the photonic pseudogap and partial localization in an absorbing layer placed onto the colloidal lattice. Furthermore, we will describe how three dimensional photonic crystals and porous one dimensional photonic crystals have been coupled successfully in real dye sensitized solar cells, where a 30% more photocurrent is observed, leading to an increase in the efficiency of the device.

Coffee and cookies will be served
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