



LUND
UNIVERSITY



NANOSCIENCE COLLOQUIUM

Thursday June 13th 2013 at 16:00, K-space, Fysicum

The Opto-Electronic Physics Which Just Broke the Efficiency Record in Solar Cells

Prof. Eli Yablonovitch

University of California, Berkeley

It is surprising that high efficiency solar cells care more about Optics than about Electronics. Counter-intuitively, efficient external fluorescence is a necessity for approaching the ultimate limits. This has led to the slogan: “A great Solar Cell also needs to be a great Light Emitting Diode”.

Why would a solar cell, meant to capture photons, benefit from emitting photons? This is a paradox that needs to be resolved.

Nonetheless, we are finally approaching the Shockley-Queisser (SQ) limit for single junction solar cells ~33.5% efficiency under the standard solar spectrum. The Alta Devices Company has reached 28.8% in a single junction flat plate cell. Previously, the record had been stuck at 25.1%, during 1990-2007.

The single-crystal thin film technology that is breaking these records is created by epitaxial liftoff, and can be produced at cost well below the other less efficient thin film solar technologies. The path is now open to a 30% efficient photovoltaic technology, which can be produced at low cost.

Suggested Reading: “Strong Internal and External Luminescence as Solar Cells Approach the Shockley–Queisser Limit”, O. D. Miller, Eli Yablonovitch, and S. R. Kurtz, IEEE J. Photovoltaics, vol. 2, pp. 303-311 (2012)

This is one in a series of Nanoscience Colloquia, aimed at researchers and students with an interest in nanoscience. They will cover different areas of nanoscience, and are given a couple of times per semester. The series is arranged by the Strategic Research Environment “The Nanometer Structure Consortium at Lund University”, “nmC@LU”, and part of the Linnaeus grant “Nanoscience and Quantum Engineering”, funded by the Swedish Research Council (VR).



Vetenskapsrådet