University of Victoria
Centre for Advanced Materials & Related Technology

CAMTEC & IESVic SEMINAR

IESVic integrated energy systems

TITLE: **New Concepts for Silicon based Thin Film Solar Cells**

SPEAKER: **Dr. Martin Vehse**
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DATE: Thursday, June 2, 2016

TIME: 2:00 – 3:00 pm

LOCATION: ECS 660

Abstract:

Most solar cells suffer from incomplete light harvesting either due to weak abortion of the emitter material or due to reflection losses. In this talk, I will introduce some examples of how the integration of nanostructures to different solar cell technologies can improve the light management and hence the cell performance.

First, an example is given, where electrochemical ZnO -nanostructures are used for light management in superstrate (p-i-n) configuration thin film Si-solar cells. The challenge is to prolong the light propagation through the absorber layer without inducing drawbacks in the electrical performance of the cell. A good solution is to applicate honeycomb-like structures which are processed by polystyrene nanosphere lithography.

The second example presents an experimental and computational comparison of identically shaped metallic (Ag) and nonmetallic (SiO2) nanoparticles integrated to the back contact of amorphous silicon solar cells. As significant improvements were achieved with both nanoparticle types over a textured reference, we conclude that the geometry of the structure has a much higher influence on the light trapping properties compared to its material. Particularly, no additional beneficial effect of the plasmonic features due to metallic nanoparticles could be observed.

The last example is the use of ZnO–nanorods to influence the coherence of the light in tandem cells which comprise ultrathin resonant-cavity-enhanced a-Ge:H absorbers. Recently, this new a-Ge cell concept was successfully developed in our group as a single cell device and should now be transferred to a tandem cell configuration with an additional a-Si thin film cell.For this reason the coherence of the light needs to be controlled in the different sub-cells. One possible way of doing so, is to use ZnO–nanorods integrated in the intermediate reflector layer.

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