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Loucas Tsakalacos

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Introduction

The solar energy industry has seen strong growth in the last decade. While the recent Great Recession has certainly had an impact on the photovoltaics (PV) industry, this has not been as severe as feared and the industry is seeing promising growth levels. Conventional silicon and thin film PV technologies are well developed and capable of meeting the clean energy demands of many markets. They will have even more impact as cost reduction and manufacturing technologies improve. Furthermore, the industry is beginning what appears to be a process of consolidation that may be representative of maturity, particularly as competition from low-cost Si manufacturers continues to provide price pressure on modules and ultimately on PV systems. Nevertheless, there continues to be interest within the research community in developing technologies that can simultaneously reduce cost yet also provide breakthrough performance. Today solar technologies that simultaneously provide high performance yet low cost and reliability are not well established or non-existent.

To this effect, research efforts in studying and applying the unique optical, electrical, and structural/architectural properties of micro and nanostructures to solar energy applications, either as novel photonic structures or as new solar cell device structures, continue to flourish. This year's fourth installment of the conference devoted to this topic (8111: Next Generation (Nano) Photonic and Cell Technologies for Solar Energy Conversion II), held at SPIE Optics & Photonics in 2011 as part of the Solar Energy + Technology track, once again demonstrated the strong interest in this field of research.

There were many significant advances presented at the conference, including 7% efficient Si nanowire solar cells, new designs for light trapping and waveguiding in PV devices, improved materials and structures for up and down conversion, demonstration of hot carrier extraction from quantum dot monolayers, high efficiency quantum dot devices, application of metamaterials to PV, use of self-assembly to create photonic structures, and novel organic and hybrid devices (joint session with OPV conference).

The conference was also highlighted by the third year of a panel discussion on Commercialization of Emerging Photovoltaic Technologies, in which experts from academia and industry discussed the prospects and challenges in developing novel PV technologies based on organic and inorganic materials. This year's panelists were as follows:

Martha Symko-Davies, National Renewable Energy Lab. (USA)

Dana Olsen, National Renewable Energy Lab. (USA)

Louay A. Eldada, SunEdison (USA)

Frank van Mierlo, 1366 Technologies, Inc. (USA)

Among the topics discussed by the panel included vertical integration of solar companies, the role of silicon in the future of the PV industry, the effect of Si feedstock impurities, the future of organic PV in the market, cost and reliability of concentrator PV, and next generation concepts.

Once again, the conference provided an excellent forum for the interchange of next generation photonic and device concepts in solar energy conversion. I would like to thank the conference Program Committee (Drs. A. Chatten, G. Conibeer, A. Salleo, S.E. Shaheen, W.G.J.H.M. van Sark, D. Wang, X. Xu, and E.T. Yu) for their great support, as well as the session chairs, authors, and SPIE staff (J. Lowell in particular) for their help in making this a successful conference.

Loucas Tsakalacos