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Alexandre Freundlich
Jean-Francois F. Guillemoles
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Introduction

Minimizing anthropogenic alterations of the world climate calls for the deployment of tens of terawatt of carbon-free renewable power generation resources, and solar photovoltaics (PV) has been recognized as a promising technology to help us meet these targets in a sustainable manner. Boosted by regulatory incentives, the PV industry is experiencing a strong growth and a significant influx of capital investment. Recent advances in solar cells and, in particular, in inexpensive thin films and concentrator PV devices, together with the growing penetration of PV into the energy markets, continue to drive down the cost of solar electricity generation. Today the production cost of the kwh in many applications approaches the retail price of electricity generated by traditional means (fossil fuels). However, in order for PV to become a major component of the global renewable energy portfolio, a nearly two-to-three-fold further cost reduction is needed. Such a cost reduction would require transformative technological breakthroughs that would significantly enhance the efficiency and/or simplicity of PV modules.

Within the framework of feeding into the innovation pipeline needed to the development of revolutionary and practically viable high efficiency and cost-effective PV technologies, this first edition of the conference attempted to capture recent advances in the modeling and application of novel photonic engineering approaches, as well as in the understanding of the physics at play for the next generation of PV devices. The conference provided an interdisciplinary forum that aimed at enhancing interactions between physicists, photonic engineers and photovoltaic device specialists, at both the experimental and theoretical levels.

Theoretical and experimental papers presented at the conference highlighted recent advances in basic material/device physics, simulation, demonstration and optimization of:

- Advanced light management concepts and architectures, including new approaches to spectral engineering, light concentration, surface texturing, and light trapping (i.e., plasmonics nano-cavities, micro/nano-engineered ARs, track-free nano-engineered concentrators), as well as synergistic hybrid/multifunctional designs.
- Non-conventional PV converters, addressing the application of advanced photonics to enable unique conversion mechanisms. Presenters also provided an in-depth discussion of the fundamental aspects and recent developments in the demonstration of advanced quantum confined or nanostructured concepts, intermediate band concepts, multiple-exciton-generations, and hot-carrier effects. Also, particular focus was placed on deciphering the science at play in photo-generation, recombination, and

carrier transport in quantum well/quantum dot, wire and superlattice devices.

- Advanced single- and multi-junction materials and devices leveraging on innovative materials or/and photonic architectures. In particular, several presentations focused on the simulation or/and demonstration of the application of cross-cutting photonic engineering approaches for enhancing the performance, reliability and functionality of thin film and multi-junction devices. Several presentations dealt with development of predictive simulation tools to optimize and enhance the defect tolerance (dislocations, radiation defects, etc.) of solar cells for space and terrestrial applications, as well as recent inroads in identifying and realizing novel more effective PV absorbers.

During and post conference, we received much positive feedback and encouragement from attendees and presenters. We are truly humbled by the experience, and hope that all attendees enjoyed the conference as much as we did. Of course, the primary ingredient for a successful technical conference is the quality of the work presented by the contributors, and, to this end, we would like to thank all the contributors for the quality of their presentations. We would like also to express our gratitude to all keynote and invited speakers for presenting exceptional overviews and igniting thought-provoking discussions. We would like also to congratulate Jonathan Grandidier and his coworkers from Caltech, as their work presented in our conference was this year's winner of the "Green Photonics Award for Renewable Energy Generation: Fusion and Photovoltaics." We are grateful to the committee members and session chairs, as their support and dedication before and during the event had a significant impact on the outcome and success of the meeting. We would like also to acknowledge the SPIE support staff for their invaluable help.

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Jean-Francois F. Guillemoles