Compound Semiconductors: Thin-Film Photovoltaics, LEDs, and Smart Energy Controls

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Compound Semiconductors: Thin-Film Photovoltaics, LEDs, and Smart Energy Controls

Symposia held April 1–5, 2013, San Francisco, California U.S.A.

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PREFACE

Symposium C, "Thin-Film Compound Semiconductor Photovoltaics" and Symposium FF, "Compound Semiconductors for Generating, Emitting, and Manipulating Energy—II" were held on April 1–5 at the 2013 MRS Spring Meeting in the San Francisco, California. This combined symposia Proceedings represents the latest technical advancements and information on compound semiconductors for generating, emitting, and manipulating energy from universities, national laboratories and industries. It provides insight into emerging trends in these exciting technologies.

The scientific and technological exploration of compound semiconductors was presented in Symposium FF for applications of light emitters, record high efficiency solar cells, and high power devices, and for low cost wide bandgap materials manufacturing. These papers present the current status of compound semiconductor solar cells—from dilute nitrides for the record solar cell efficiencies, photon-recycling for understanding and designing single and multi-junction solar cells, concept and experimental progress of multiple subcells for a full spectrum module, to nano-structure solar cells for high efficiency solar cells at low cost. High power electronics with voltage range from 1 to 100 kV represent a large percentage of the current total power electronics market. High voltage electronics will be essential for next generation high voltage grids for renewable energy such as large-scale wind and solar farms. Several important contributions are given concerning the wide-bandgap materials such as GaN, SiC, and ZnO and the improvements in device processing to yield significant performance improvements. Finally, low cost processes will play a key role for the competitiveness of compound semiconductor devices relative to the Si-based devices. An upsurge of research is occurring and is presented into direct growth of GaN-based devices on large-area Si substrates as well as the incorporation of compound semiconductor-based devices within Si microelectronics.

Symposium C focuses on advances in the materials science, processing, and device issues of thin-film compound semiconductor materials in photovoltaic solar cells and related applications. Relevant materials include chalcogenide semiconductors, such as Cu(In,Ga)Se2 and related chalcopyrite alloys, CdTe, CdS, $Cu_2ZnSn(S,Se)_4$, n-type and p-type transparent conducting oxides, and novel materials with importance for thin-film photovoltaics. Among the recent developments that are being highlighted in the proceedings are advances in the characterization of bulk and interface properties in both materials and devices; film deposition and device processing; new earth-abundant

materials; fundamentals of defects, grain boundaries, and surfaces; and innovative diagnostic and control tools critical for scale-up and manufacturing.

The organizers of Symposium C would like to thank the National Science Foundation, DuPont Central Research and Development, and GE Global Research for their generous support of the symposium.

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