

**Amorphous and Polycrystalline Thin-Film
Silicon Science and Technology—2012**

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PREFACE

This volume includes sixty-two papers presented in the MRS Symposium A, “Amorphous and Polycrystalline Thin Film Silicon Science and Technology – 2012”, which took place on April 9-13, 2012, in San Francisco, California. The symposium covers the science and technology of thin-film silicon based materials and devices. The symposium traditionally started off on April 9 with a well-attended full-day tutorial aimed at young researchers and people new to the field. The tutorial was lectured by Prof. Eric A. Schiff (Syracuse University, USA) and Dr. Qi Wang (National Renewable Energy Laboratory, USA). During the four days of fourteen oral sessions and two evenings of poster presentations, 13 invited talks reviewed the recent progress and addressed the scientific and technical issues in the field; 58 oral and 58 poster presentations reported new results in various areas, covering fundamental studies and advances in technology.

Among various applications, solar cells for photovoltaic energy conversion and thin-film transistors for flat-panel displays have been the two major driving forces for research and development of thin-film silicon materials and devices. In the past few years, the thin-film silicon community has mainly focused on thin-film silicon solar cells to address the issues of efficiency, manufacturing capability and manufacturing cost. This year Symposium A held a special session focusing on industry. Three invited speakers, Dr. Jeffrey Yang (United Solar, USA), Dr. Nitsuhiro Matsumoto (Panasonic, Japan), and Dr. Xinwei Niu (Chint Solar, China) reviewed manufacturing processes, challenges, and future perspective for the thin-film silicon photovoltaic manufacturing. Dr. Xinwei Niu reported that the manufacturing cost of thin-film amorphous and microcrystalline silicon double-junction solar modules with stable efficiency of around 10% using the Oerlikon production line in China is \$0.75/W. This is an important milestone for the thin-film solar cell manufacturing that boosts confidence in thin-film silicon photovoltaics as a viable technology for large volume production. On a similar topic, Dr. Guozhen Yue of United Solar, USA, reported stable active-area efficiency of 13.6% using amorphous and microcrystalline silicon triple-junction solar cells, which is the highest stable efficiency for thin-film silicon solar cells. New light trapping and light management approaches to enhance the photon harvesting of the sun light have been investigated, including plasmonic light scattering using metal and dielectric nano-particles and photonic structures. Prof. Rana Biswas from Iowa State University, USA, reviewed the recent progress in advanced light trapping using nano-structured photonic and plasmonic structures and demonstrated that, in principle, the classical limit can be exceeded. Significant progress has been made in the fundamental studies of thin film silicon materials, especially microcrystalline silicon materials and devices. Prof. James Im of Columbia University, USA, presented a new generation of laser-crystallization approaches that can crystallize silicon films for large-area active-matrix displays. Prof. Pere Roca i Cabarrocas from École Polytechnique, France, discussed low-temperature plasma synthesis of silicon and germanium nanocrystals and their application to the growth of a variety of thin films, spanning the range from fully-disordered to fully-ordered materials. Other topics included rapid thermal annealing for thin-film transistors by Prof. Seiichiro Higashi (Hiroshima University, Japan), atomic scale

modeling of amorphous silicon photovoltaics by Prof. Jeffrey C. Grossman (Massachusetts Institute of Technology, USA), etc.

We had a very successful and enjoyable symposium. The number of presentations and attendees reflect the great need for development of thin-film silicon materials and devices. Unique and advanced results ensured the high quality of the symposium. As the organizers of Symposium-A, we greatly acknowledge the invaluable contributions of the authors of oral and poster presentations, especially those who made written contributions to this volume.

The symposium organizers thank everyone involved in the Symposium before, during, and after the conference. The organizers greatly appreciate help from the members of the program committee, namely R. Biswas (Iowa State University, USA), V. Chu (INESC, Portugal), P.R. i Cabarocas (École Polytechnique, France), F. Finger (Forschungszentrum Jülich, Germany), S. Higashi (Hiroshima University, Japan), P. Stradins (NREL, USA), Q. Wang (NREL, USA), and M. Zeman (Delft University of Technology, The Netherlands). They kindly reviewed all submitted abstracts, which helped the organizers to prepare an interesting program. Special appreciation goes to all referees for their careful review of the proceeding manuscripts and valuable feedback provided to the authors. We sincerely thank Mary Ann Woolf, who supervised and managed the abstract and manuscript reviewing process. Her experience, dedication and hard work allowed for a smooth and timely production of this volume. The MRS staff provided valuable support throughout the organization of the Symposium and in the preparation of this proceeding.

On behalf of all the participants, we thank for the generous financial support of our corporate sponsors: Forschungszentrum Juelich, GmbH, Germany, National Renewable Energy Laboratory, USA, and United Solar Ovonic LLC, USA.

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