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Amorphous and Polycrystalline Thin-Film Silicon Science and Technology—2007

Editors: Virginia Chu, Seiichi Miyazaki, Arokia Nathan, Jeffrey Yang and Hsiao-Wen Zan
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**Amorphous and Polycrystalline
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and Technology—2007**

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EDITORS:

Virginia Chu

INESC MN
Lisboa, Portugal

Seiichi Miyazaki

Hiroshima University
Higashi-Hiroshima, Japan

Arokia Nathan

London Centre for Nanotechnology – UCL
London, United Kingdom

Jeffrey Yang

United Solar Ovonic LLC
Troy, Michigan, U.S.A.

Hsiao-Wen Zan

National Chiao Tung University
Hsinchu, Taiwan



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Warrendale, Pennsylvania

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PREFACE

Hydrogenated amorphous silicon has grown into a multi-billion dollar industry encompassing commercial products such as active-matrix liquid crystal displays, solar cells, digital imagers and scanners. Advances in technology have enabled deposition on large area glass substrates with dimensions of 2.16 m × 2.46 m for the 8th generation TFT LCD displays and 1 m × 1.4 m for solar cells, as well as utilization of roll-to-roll processing on metallic and polymeric substrates allowing the development of new applications and the reduction of production costs. For active-matrix liquid crystal displays, significant progress has been made by using amorphous, nanocrystalline, and polycrystalline silicon and alloys. Current challenges lie in on-panel integration of the peripheral electronics for large area displays. With active-matrix organic light emitting diode displays, choice of appropriate and scalable materials technology still remains a question. Here, key technology requirements are large area uniformity of transistor parameters, threshold-voltage stability, and a carrier mobility that is higher than amorphous silicon. Nano-crystalline silicon is viewed with great promise for this application. For polycrystalline silicon, novel grain control technologies have been proposed and improved to realize large grain size and to diminish the defects inside the grain leading to the realization of single-crystal transistor on glass substrates. Issues on large-area and flexible substrates are addressed by both invited and contributed papers. As we witness the rapid growth of the photovoltaic market in recent years, thin-film technology using amorphous silicon based alloys has also gained momentum; large manufacturing plants are being built around the world. In the meantime, tandem structures incorporating both amorphous and nanocrystalline silicon materials have been further developed and show promise for production. In addition to the two major applications, amorphous and nanocrystalline silicon based large-area electronics have found new applications in the biomedical arena. The success of amorphous silicon and polysilicon materials in commercial products is the driving force for Symposium A being one of the longest-running symposia of the Materials Research Society, providing an excellent forum for reporting research results, exchanging ideas, and discussing scientific and technological issues.

Symposium A, “Amorphous and Polycrystalline Thin-Film Silicon Science and Technology—2007,” was held April 9–13 at the 2007 MRS Spring Meeting in San Francisco, California. The symposium started off on April 9 with an extremely well-attended full-day tutorial aimed at young researchers and people new to the field, organized by Friedhelm Finger and Michio Kondo. There were 13 invited talks, 58 contributed oral presentations and 83 poster presentations spread over the next three and one-half days. Renewed interest in photovoltaics resulted in three very well-attended oral sessions on this topic. The continued technological importance of thin-film transistors also figured prominently in the symposium, with sessions on both amorphous and polycrystalline silicon TFTs. Studies of deposition, especially scaling to large area substrates and crystallization techniques, also drew special attention. Fundamental studies on long-outstanding issues in amorphous silicon have continued. Material characterizations for new materials such as nanocrystalline and polycrystalline materials and alloys are hot topics in the symposium. Carrier transport and defect structures in nanocrystalline silicon have been widely studied, providing important information for material optimization, device simulation, and device design.

The success of Symposium A is a direct consequence of the high-quality invited and contributed presentations and the energetic scientific exchange that takes place during oral and poster sessions. So we first acknowledge the invaluable contribution of the authors of oral and poster presentations as well as the written contributions in this volume.

Many people worked behind the scenes to make things run smoothly before, during and after the conference. As in past years, Mary Ann Woolf supervised and managed the manuscript reviewing process, and her experience allowed for the smooth and timely production of this

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proceedings volume. Many people were asked to review the papers published here, and we thank them for the time that they took to give valuable feedback to the authors. The MRS staff provided friendly and professional support throughout the organization of the symposium and proceedings.

Finally, we gratefully acknowledge the generous financial support of our corporate sponsors: AKT/Applied Materials, Asahi Glass, AU Optronics, Fuji Electric, NREL, United Solar Ovonic LLC, and ULVAC.

Virginia Chu
Seiichi Miyazaki
Arokia Nathan
Jeffrey Yang
Hsiao-Wen Zan

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