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Thermoelectric Materials Research and Device Development for Power Conversion and Refrigeration

EDITORS

George S. Nolas

Yuri Grin

David Johnson

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Thermoelectric Materials Research and Device Development for Power Conversion and Refrigeration

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Thermoelectric Materials Research and Device Development for Power Conversion and Refrigeration

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PREFACE

Symposium B, “Thermoelectric Materials Research and Device Development for Power Conversion and Refrigeration,” held from November 26 – 30 at the 2012 MRS Fall Meeting in Boston, Massachusetts, was the tenth in a series of symposia on state-of-the-art materials and technologies for direct thermal-to-electric energy conversion that produced proceedings with primary focus on material and technological advances of thermoelectrics and thermionics [see MRS Proceedings volumes 234, 478, 545, 626, 691, 793, 886, 1044 and 1166]. In this symposium there were 263 contributed presentations, the largest by far at the MRS, including 10 invited talks and 168 poster presentations. These presentations were given from researchers from academia, national laboratories, and industry in the United States, Asia and Europe. The symposia covered a broad range of topics in the areas of materials, measurement techniques, and device development.

The papers were divided into different sections and included Bulk Materials, such as Skutterudites, Clathrates, different chalcogenide compositions and oxides, Thin Films, Thermionics, Nanocomposites and Nanostructured Materials and Device Development. This volume provides an overview of the exciting recent developments in the field. The continuing interest in the area of thermoelectric materials research, as well as device-related research, was evidenced by the excellent level of attendance throughout the symposium.

As with previous symposia in this series, there were a large number of graduate student presentations. Such student participation continues to be a focus of our symposium, emphasizing the mentoring of our future scientists in this field of materials research. With the generous support from our sponsors, the symposium organizers were able to give eighteen student presentation awards.

Oral Presentations

Samantha Clarke (University California, Los Angeles), “Optimizing Thermoelectric Efficiency of $\text{La}_{3-x}\text{Te}_4$ with Alkaline Earth Metal Substitution”

Jeffrey Doak (Northwestern University), “Dopants, Solubility, and Vibrations in PbS-PbTe Alloys”

Rachel Korkosz (Northwestern University), “High Performance Na-doped PbTe-PbSe-PbS Thermoelectric Materials”

Jaeho Lee (Stanford University), “Phase Purity and the Thermoelectric Properties of $\text{Ge}_2\text{Sb}_2\text{Te}_5$ Films for Phase Change Memory”

Gloria Lehr (Michigan State University), “A Study of the Relationship between Intermediate Valence and Seebeck Coefficient in Yb-Al Compounds”

Pooja Puneet (Clemson University), “Decoupling Thermoelectric Properties of Polycrystalline Bi via Surface Modification”

Poster Presentations

Peng Gao (Michigan State University), “Optimizing the Thermoelectric Properties of $\text{Mg}_2\text{Si}_{0.4}\text{Sn}_{0.6}$ by Mg Compensation and Sb Doping”

Shintarou Mikami (Muroran Institute of Technology, Japan), “Sintering of $\text{Cu}_2\text{ZnSnS}_4$ Synthesized by Solid-phase Reaction of Sulfides and its Thermoelectric Properties”

Maribel Maldonado (University of Texas at Dallas), “Deposition and Doping of Thin-film Mg_2Si ”

Hua He (University of Delaware), “Synthesis, Crystal Structure, Electronic Structure, and Thermoelectric Properties of $\text{Rb}_2\text{Cd}_5\text{As}_4$ and the Solid Solution $\text{Rb}_2\text{Cd}_5(\text{As},\text{Sb})_4$ ”

Mohsin Saleemi (KTH Royal Institute of Technology, Sweden), “Fabrication of Nanostructured Bulk Cobalt Antimonide (CoSb_3) Based Skutterudites via Bottom-up Synthesis”

Bolin Liao (Massachusetts Institute of Technology), “Cloaking Core-shell Nanoparticles from Conducting Electrons in Solids”

Laetitia Boulat (University of Montpellier, France), “Diffusion Barriers for $\text{CeFe}_4\text{Sb}_{12}/\text{Cu}$ Thermoelectric Devices”

Michael Gaultois (University of California, Santa Barbara), “Exploiting Electronic Instability to Optimize Seebeck and Electrical Conductivity”

The organizers are most grateful for the support of the Aldrich Materials Science, FCT Systeme GmbH, Fuji Electronic Industrial Co, Ltd., GE Global Research, General Motors Corp., Marlow Industries, Inc., a subsidiary of II-VI Inc., M. Braun, Inc., and Thermal Technologies, LLC. This support enabled the eighteen student awards.

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