Energy Harvesting - From Fundamentals to Devices, MRS 2011 Spring Meeting, Symposium E

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Details:

MRS Symposium E: Energy Harvesting From Fundamentals to Devices

Energy harvesting refers to the set of processes by which useful energy is captured from waste, environmental, or mechanical sources and is converted to a usable form and stored. Energy harvesting is a broad topic that includes established methods and materials such as thermoelectrics, as well as more recent energy-harvesting technologies that convert mechanical energy, magnetic energy, and waste heat to electricity. This symposium will explore various state-of-the-art materials and devices for direct energy conversion, from thermal-to-electric to multistep energy-conversion technologies, including thermionics, thermoacoustics, and compound thermoelectrics. The symposium will highlight both the fundamental materials science underlying energy-harvesting principles and devices, as well as emphasize device-design innovations that lead to higher efficiency energy harvesting or conversion technologies. In addition, potential applications for these technologies will be discussed with the intention on linking specific material properties, issues, and needs to desired applications ranging from the cm/mm scale-down to MEMS/NEMS (micro- and nanoelectromechanical systems) devices.

The symposium will also highlight the multidisciplinary nature of the research (materials science,

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physics, chemistry, and applied engineering) necessary to advance the field. Theoretical studies will be presented to address transport properties, crystal chemistry, thermodynamic analysis, energy transfer, system efficiency, and device operation. New developments in experimental methods, device design and fabrication, nanostructured materials fabrication, materials properties, and device-performance measurement techniques will be emphasized.

Session topics will include:

- Modeling the efficiency of energy-harvesting devices
- Energy harvesting for wireless sensors
- Innovative devices for harvesting mechanical, magnetic, and low-quality waste heat
- Computational design of new materials for thermoelectric and mechanical/magnetic devices
- Application of multiferroic materials to energy harvesting
- Compound thermoelectric, thermionic, and thermoacoustic materials
- Nanostructured materials for energy-harvesting applications
- Advanced concepts in thermoelectric materials

Invited speakers include:

David Andrews (Univ. of East Anglia, United Kingdom), Lon Bell (BSST), Greg Carman (Univ. of California, Los Angeles), Gang Chen (Massachusetts Inst. of Technology), Ryoji Funahashi (AIST: National Inst. of Advanced Industrial Science and Technology, Japan), Viktoria Greanya (DARPA), Mercouri Kanatzidis (Northwestern Univ.), Carl Koch (North Carolina State Univ.), Laura H. Lewis (Northeastern Univ.), Joe Poon (Univ. of Virginia), Ramesh Ramamoorthy (Univ. of California, Berkeley, LBNL), and Eric Yeatman (Imperial College London, United Kingdom). Additional invited speakers will be selected from the contributed abstracts.

Symposium Organizers

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