

Symposium 25:

Direct Thermal-to-Electrical Energy Conversion Materials and Thermal Energy Harnessing Challenges

Thermal energy conversion and harnessing - TECH - is one of the ultimate challenges in science and technology to make our modern society more efficient as well as environmentally benign. Scientific and technological progress in materials design and synthesis has always been a key to develop direct thermal-to-electrical energy conversion and related technologies. Moreover, recent advances in nanotechnology have elicited unconventional thermal transport across nanostructured materials and nano-interfaces, realizing a novel means to harness thermal energy. This symposium provides an open forum to highlight up-to-date theoretical ideas, new materials, and new device concepts and applications by focusing on novel processing and synthesis methods, materials, technologies, and applications related to direct thermal-to-electrical energy conversion and thermal energy harnessing. Thermal, electrical, and mechanical properties of new materials and processing of those materials into device structures will also be emphasized. It also highlights theoretical insight and materials innovations in unconventional heat transfer that enables us novel approaches toward higher efficiency and revolutionary technologies in thermal energy harvesting and heat management.

<PROPOSED SESSION TOPICS>

- High-efficiency bulk thermoelectric materials
- Nanoscale thermoelectric materials and nanocomposites (nanomaterials and inherent nanostructures in bulk thermoelectric material matrices)
- Theoretical studies on material transport properties, band structures, crystal chemistry, thermodynamic analysis, and energy transfer for high-efficiency thermoelectric energy conversion
- Oxides and other materials with strong electron correlation and spin freedom exploitation
- Thermionics and other related topics
- New capabilities in solid-state synthesis, bulk materials, thin films, superlattices, nano-interfaces, and nanostructured materials for novel materials and compounds
- Processing of bulk and thin-film nanostructured materials
- Inorganic/organic hybrids and nanocarbon materials for energy harvesting and flexible/wearable thermoelectric applications
- New developments in material property and device performance measurements/ metrology
- Novel ideas, materials, and device concepts for thermal energy harnessing
- Phase transformation, thermal conductivity switching, and defect engineering in inorganic and organic solids for thermal energy harnessing
- Phonon engineering and emerging thermal transport technologies
- Phonon transmission and scattering across nano-interfaces
- Design, performance testing, fabrication, and processing of thermal energy conversion devices
- Device performance requirements for future TECH applications

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<INVITED LECTURES>

Tentative invited lecture information is posted in the following URL;

http://www.ceramic.or.jp/pacrim13/list_of_invited_speakers.html#25