Abstract for an Invited Paper
for the TS4CF08 Meeting of
The American Physical Society

Electron and Phonon Transport in Thermoelectric Thin Films and Nanostructures[1]

BARRY ZINK, University of Denver

Clean, high-efficiency energy technologies are likely to involve devices that employ more than one route to energy conversion. For example, adding a thermoelectric generator to a solar cell could improve the efficiency of overall energy production by converting unused thermal energy to electric energy. Though recent years have seen significant advances, the new developments in materials that will allow thermoelectric devices to fully realize their potential for energy conversion remain elusive. Nanoscale engineering of materials, made possible by modern tools for patterning and manipulation of matter at small length scales, has shown early promise and may lead to rapid improvement in thermoelectrics. A fairly wide range of fundamental studies reveal that the electronic, vibrational, and magnetic excitations in such systems can behave much differently than in bulk, equilibrium phases, but some measurements that are particularly important for thermoelectrics remain very challenging for systems such as thin films and nanowires. This talk will briefly introduce the challenges of thermal measurements of small samples and the fascinating physics of such systems, and describe our current work toward identifying potential breakthroughs in thermoelectric materials through direct experimental studies of electronic, vibrational, and magnetic excitations in small structures and novel materials.

[1]We thank the ACS Petroleum Research Fund and the University of Denver for support.