Contribution ID: **59** Type: **ORAL**

Design, Fabrication, and Characterization of Thermoelectric Devices from Multilayer Thin Films

Wednesday, April 1, 2026 2:10 PM (20 minutes)

Design, Fabrication, and Characterization of Thermoelectric Devices from Multilayer Thin Films

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Abstract:
The objective of this project is to use nano-engineering and nanofabrication to develop nanostructured thermoelectric materials for application in high-efficiency thermoelectric power generators and solid-state micro cooling devices. Multi-nano-layered super-lattice thin films of Bi2Te3/Sb2Te3 were grown using ultra-high vacuum-based deposition methods for achieving a high thermoelectric figure of merit, ZT. To significantly increase the ZT value, the values of the Seebeck coefficient and electrical conductivity should increase while the thermal conductivity should decrease for the efficient thermoelectric generators and thermoelectric coolers.
Bi2Te3/Sb2Te3 multilayer thermoelectric devices were fabricated and these samples addition to the previous single layers of Bi2Te3 and Sb2Te3 samples were characterized. The planned characterization techniques listed as: Seebeck Coefficient, Thermal Conductivity, four probe Hall effect measurements, SEM/EDS, XPS/Raman, I-V Characterizations, Impedance Measurements. After the characterizations are performed, the nanofabrication of the thermoelectric devices will be performed using the best recipe for the high efficient thermoelectric devices. The findings will be shared during the conference.

Academic or Professional Status

Undergraduate Student

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Session Classification: Technical Session 1

Track Classification: Materials & Devices: Material & Devices - (d)