

Colloquium

Thermoelectrics, Challenges and Recent Advances

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Thermoelectricity is old but it can play an important role in addressing the problems of energy utilization and management. The major challenge facing the thermoelectric research is to improve the efficiency which depends on dimensionless figure of merit $ZT = S^2 \sigma T / \kappa$ (S is thermopower, σ is electrical conductivity, κ is total thermal conductivity usually dominated by the phonons and T is the operating temperature). To achieve higher efficiency, ideas like quantum confinement, electron crystal phonon glass, nano-structuring, hierarchical structures, energy filtering, low-dimensional charge transport created by highly anisotropic electronic band structure, etc. have impacted the field of thermoelectrics during the last several decades. In this talk I will review some of the recent advances in the field and discuss how ab initio theoretical calculations are contributing to and clarifying these ideas. I will discuss the physics of systems with intrinsically low thermal conductivity, bulk systems with effective superlattice structure, and three-dimensional systems with highly anisotropic electronic bands. If time permits I will talk about thermoelectric phenomena in the quantum transport regime.

Monday, Feb 11th 2019

4:00 PM (Tea/Coffee at 3:30 PM)

Auditorium, TIFR-H