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Thermoelectric Properties and the Benefits of Nanostructuring and Electronic Structure Modifications[1]

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Recent experimental and theoretical research has shown that there are several routes with promising results for obtaining materials with improved thermoelectric characteristics. In particular, it has been demonstrated that nanostructured composites, such as bulk thermoelectrics with nanoinclusions and granular composites, offer the possibility to decrease the thermal conductivity and increase the power factor. The key ingredient for such an enhancement is the carrier scattering from the interfaces. The possibility of increasing the power factor through electronic structure modifications has also been recognized. In this case, this is due to resonant dopant levels located in the band gap region of the thermoelectric material. In this talk, I will discuss recent developments in our fundamental understanding of thermoelectric transport when nanostructuring and electronic structure modifications due to dopant resonant levels are present. Examination of theoretical advancements as well as important experimental results will be presented. The importance of the characteristics of the specific thermoelectric materials will also be discussed. *In collaboration with A. Popescu, A. Datta, and G.S. Nolas, University of South Florida, Tampa, FL 33620.*

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