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Universal Scaling Relations for the Thermoelectric Power Factor of Semiconducting Nanostructures JANE CORNETT, ODED RABIN, University of Maryland — We present a model for the power factor (PF) of wires and thin films which bridges between strongly confined and bulk behavior. Relevant scattering mechanisms are considered in the framework of the relaxation time approximation. Previous models for the transport properties of nanostructured thermoelectric materials predicted vast improvements in the PF values over bulk due to discretization of the electron density-of-states function as the result of confinement. Using this model, we find that the PF of nanowires and thin films in fact falls below the bulk value for most of the experimentally-accessible size range. We find a non-monotonic relationship between PF and system size in all systems studied—regardless of the particular materials parameters and dominant scattering mechanisms. The effects of the size, dimensionality, temperature, carrier concentration and dominant scattering mechanism in single-carrier semiconductors will be discussed. In the framework of the *constant* relaxation time approximation, universal scaling relations for the power factor of all single-carrier semiconductors are obtained.

Jane E. Cornett
University of Maryland

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