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Thermal Conductivity of Random Multilayer Thin Films ANTHONY FRACHIONI, B.E. WHITE JR., Binghamton University — Thermoelectric based energy scavenging has tremendous potential for the recovery of waste heat and temperature regulation. Manufactured thermoelectric devices today are limited in efficiency, and therefore widespread use, by high lattice thermal conductivity. In an effort to minimize lattice conductivity with respect to electrical conductivity, opportunities for utilizing the Anderson localization of phonons have been explored. In particular, the thermal conductivity of a model random multilayer thin film with Lennard-Jones bonding has been determined using classical reverse non-equilibrium molecular dynamics as a function of mass induced disorder. Results indicate that the inclusion of random planes in which the atomic mass has been increased by a factor of ten can produce reductions in lattice thermal conductivity by over a factor of one hundred. The dependence of thermal conductivity on the magnitude and nature of this disorder has been measured. Finite size effects have been quantified and a length scale has been determined on which they can be neglected. These results indicate that the pursuit of nanostructured thermoelectric materials in the form of random multilayers may provide a path to efficient and sustainable thermoelectric materials.

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