Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Power Factor Improvements in PEDOT:PSS Tellurium Nanowire Composites SHANNON YEE, University of California, Berkeley, NELSON COATES, JEFFREY URBAN, Lawrence Berkeley National Laboratory, RACHEL SEGALMAN, University of California, Berkeley — The thermoelectric properties of a composite consisting of tellurium nanowires in a conducting polymer, poly(3,4-ethylenedioxythiophene) poly(styrenesulfonate) (PEDOT:PSS) matrix, is optimized by controlling the shape of the nanowire and doping of the polymeric matrix with polar solvents. The mechanism for an observed improvement in power factor is attributed to the unique conducting nature of PEDOT:PSS, which exhibits a transition from a hopping transport-dominated regime to a diffusive transport-dominated regime upon doping with polar solvents. Near this transition, the electrical conductivity of the composite is improved without significantly reducing the thermopower. Relying on this principle, the power factor optimization for this new thermoelectric material is experimentally carried out and found to exceed 100 μ W/m-K^2, which is nearly five orders of magnitude greater than pure PEDOT:PSS. This improvement in power factor suggests a new area of research into polymer based thermoelectric materials where transport interactions between the polymer and an inorganic component can be tuned.

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Date submitted: 21 Nov 2012 Electronic form version 1.4