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Interfacial Interactions in Polymer-Nanocrystal Thermoelectric Composites Provide a Novel Route for Power Factor Enhancement NELSON E. COATES, Lawrence Berkeley National Laboratory, SHANNON K. YEE, Mechanical Engineering, University of California, Berkeley, BORIS RUSS, Department of Chemical and Biomolecular Engineering, University of California, Berkeley, JEFFREY J. URBAN, Lawrence Berkeley National Laboratory, RACHEL A. SEGALMAN, Department of Chemical and Biomolecular Engineering, University of California, Berkeley — The highest performing thermoelectric materials currently available are fabricated via expensive high-temperature vacuum processing techniques. Recently, there has been an increasing interest in the thermoelectric properties of solution-processable materials, which have the potential to dramatically reduce module fabrication costs. These solution-processed materials however often exhibit poor transport properties, which undermines their competitive advantage over the more traditional expensive thermoelectric materials. Here, we present the thermoelectric transport properties of a new class of solution-processable conducting-polymer/inorganic composite materials as a function of nanocrystal loading. In the Poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS) and Tellurium nanowire composite devices fabricated for this study, the thermoelectric performance of the composite exceeds that of either pure organic or inorganic component alone. This result suggests an interface-driven mechanism for this enhanced performance and provides an exciting route for improving the power factors of organic-inorganic hybrid thermoelectrics.

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