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Solution Processable Hybrid Polymer-Inorganic Thermoelectric Materials SHANNON YEE, University of California, Berkeley, NELSON COATES, KEVIN SEE, JEFFREY URBAN, Lawrence Berkeley National Laboratory, RACHEL SEGALMAN, University of California, Berkeley — In the last decade thermoelectric material improvements have largely been attributed to a reduction in thermal conductivity due to nanostructuring. An alternative approach is to decouple and optimize the power factor using the unique properties of organic-inorganic interfaces. One method to do this could rely on the electrical properties of a conducting polymer in combination with the thermoelectrical proprieties of an inorganic semiconductors. It is expected that the thermal conductivity of this hybrid material would be low due to the inherent phonon mismatch between polymers and inorganics. Recently we have developed a method for producing a solution processable bulk thermoelectric material (ZT>0.1) using a hybrid polymer-inorganic systems consisting of crystalline tellurium nanowires coated in a thin layer of PEDOT:PSS. The interface properties of these materials scale and bulk films demonstrate enhanced transport properties beyond those of either component. Here, we present our methodology, theoretical explanation, and experimental transport properties of this new class of materials where the thermal conductivity, electrical conductivity, and thermopower predictably vary as a function of polymer loading in the hybrid composite.

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