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Semiconductor Nanocomposites for Direct Energy Conversion Applications JEFF URBAN, IBM/MSU, DMITRI TALAPIN, ELENA SHEVCHENKO, CHRIS MURRAY, IBM, MERCOURI KANATZIDIS, MSU — Novel materials for thermoelectric and photovoltaic applications may be rationally designed by assembling quantum dots with distinct thermal, optical, and electronic characteristics into nanocomposite superlattices and glassy thin films. Here we present the synthesis and initial thermoelectric characterization of semiconductor nanocomposites composed of lead chalcogenide (PbX = PbS, PbSe, PbTe) nanocrystals. Monodisperse nanocrystals of all PbX materials varying in size from ∼4-10nm are synthesized, and their structural, optical, and electronic properties are presented. Well-ordered nanocomposites composed of two different types of PbX nanocrystals are synthesized and their basic thermoelectric characteristics are studied. The strategy of using nanocrystal composites for thermoelectric applications will, in principle, provide an opportunity to independently tune the desired electronic and phonon scattering characteristics of these materials.

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