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Nanostructure Approach for High-performance Thermoelectrics, Photovoltaics, and Biosensing

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Nanomaterials have many potential applications in energy conversion systems due to their special structural and physical properties. Such applications often require materials manufacturing at large scale and low cost. In the first part of this talk, I will discuss the manufacturing of nanostructured bulk thermoelectric materials at large scale with improved thermoelectric properties. The materials were produced by a low cost ball milling and hot pressing process. The ball milling makes nanopowders in the quantities of up to multiple tons. Such nanopowders were then hot pressed by a direct current induced hot pressing into dense bulk materials. In the second part of this talk, I will demonstrate the concept and realization of nano coax cables that can be used for sub-wavelength light transmission and efficient solar conversion into electricity. In the last part of this talk, I will show a highly sensitive biosensor using aligned carbon nanotubes and gas sensors using nano coaxial cables.