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Nanopowder Synthesis and Characterization of the Natural Superlattice $(Bi_2)_m(Bi_2Te_3)_n$ for Prospective Thermoelectric Materials BRIAN S. WASHBURNE, Dept. of Physics, John Carroll University, RYAN R. SALATA, Depts. of Physics and Chemistry, John Carroll University, PAUL R. CHALLEN, Dept. of Chemistry, John Carroll University, JEFFREY S. DYCK, Dept. of Physics, John Carroll University — With a growing demand for renewable and clean energy sources, the scientific community has been called upon to develop technologies that will realize decreased dependence on traditional energy sources and reduce inefficiencies in current energy consumption. Efforts have focused on producing cost effective, high quality thermoelectric materials that are commercially viable. Nanocrystals of bismuth telluride (Bi_2Te_3) can be synthesized through scalable bottom-up, wet-chemical methods. In this study, rapid nanocrystal growth is accomplished through microwave stimulation of organically dissolved bismuth and tellurium precursors within the time of one minute. This method is low cost, energy efficient, and relatively quick. While the aim of our studies have been to synthesize and characterize nanocrystalline Bi_2Te_3, elemental analysis of our product using Inductively Coupled Plasma Spectroscopy indicated that our samples have excess Bi. Together with structure analysis using Powder X-ray Diffraction, these compounds can be understood to fit within the infinitely adaptive series $(Bi_2)_m(Bi_2Te_3)_n$ with m:n near 2:1. This structure corresponds to a natural superlattice of Bi_2 and Bi_2Te_3 blocks.

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