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Nanopowder Synthesis and Characterization of Bismuth Telluride Nanoparticles for Prospective Thermoelectric Materials ZACHARY S. BUKSZAR, PAUL C. CHALLEN, Department of Chemistry, John Carroll University, C. VIRGIL SOLOMON, Department of Mechanical & Industrial Engineering, Youngstown State University, JEFFREY S. DYCK, Department of Physics, John Carroll University — The demand for high efficiency thermoelectric devices is on the rise as they provide a means for clean renewable energy. Bismuth telluride (Bi_2Te_3) is an efficient room temperature thermoelectric material that can be synthesized through scalable bottom-up wet-chemical methods. In this study, nanocrystal growth is accomplished through microwave stimulation of organically dissolved bismuth and tellurium precursors within reaction times on the scale of two minutes. The use of this method helps in achieving commercial viability due to the low time and energy costs required. The aim of our studies has been to synthesize nanocrystalline Bi_2Te_3, and characterize the nanoparticles by Inductively Coupled Plasma Spectroscopy (ICP-OES), Powder X-Ray Diffraction (XRD) and Scanning Electron Microscopy (SEM). By altering stoichiometric ratios of tellurium/bismuth in the precursor solutions, we obtain different product stoichiometries that could be understood to fit within the infinitely adaptive series $(Bi_2)m(Bi_2Te_3)n$. With appropriate choice of concentration for precursor solutions we obtain fairly pure Bi_2Te_3. The structure shown through SEM and XRD corresponds to $\sim$ 10nm thick hexagonal platelets of Bi_2Te_3 with the possibility of Bi_2 blocks integrating themselves into the structure as the ratio of m:n increases.

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