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**Bottom-up wet chemical synthesis and characterization of $Bi_xTe_y$ nanoparticles** BRENDAN S. BROWN, DANIEL J. VOLPE, JEFFREY S. DYCK, Department of Physics, John Carroll University, PAUL C. CHALLEN, Department of Chemistry, John Carroll University, VIRGIL C. SOLOMON, Department of Mechanical Engineering, Youngstown State University — $Bi_xTe_y$ is an interesting series of compounds for which certain x:y ratios result in formation of a natural superlattice structure. The different stoichiometric ratios, designated by the x and y, is better represented by $(Bi_2)_m(Bi_2Te_3)_n$ where m and n are integers, and is an infinitely adaptable series. For this study, we have chosen x:y to be 1:1, 2:3 and 2:1 which are expected to form the natural superlattice with m and n values. The alternating layers of $Bi_2$ groups and $Bi_2Te_3$ groups stack along the c-axis of the lattice according to the m:n ratio. $Bi_2Te_3$ is a well-studied thermoelectric material, and the work done in this project may have potential implications for optimizing the material. Using a bottom up wet chemical synthesis, the desired ratios have been produced in high yields. X-Ray Diffraction is consistent with the intended compounds, but also shows free tellurium as an impurity. Using Scanning Electron Microscopy and Energy Dispersive X-Ray Spectroscopy, the particles are found to be nanoscale and the elemental analysis shows the stoichiometry is close to the desired ratios.

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