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Electrical, Thermal, and Thermoelectric Characterizations of Vapor Solid Bi_2Te_3 Nanoplates MICHAEL PETTES, LI SHI, The University of Texas at Austin — Single-crystal nanoplates of Bi_2Te_3 synthesized by the vapor solid method are characterized by electrical, thermal, and thermoelectrical measurements. The Bi_2Te_3 domains investigated are less than 12 nm thick and are suspended to remove substrate doping effects. A room temperature thermal conductivity of 1.5 $Wm^{-1}K^{-1}$ was measured, lower than the 1.8–3.3 $Wm^{-1}K^{-1}$ range reported for bulk crystals with different carrier types and concentrations. The room temperature electrical conductivity was measured at 1.5×10^5 Sm^{-1}. Applying the Wiedemann-Franz Law, the electron contribution to the total thermal conductivity is nearly 40 % at room temperature. The electrical conductivity is similar to that reported for bulk single crystals at an electron concentration of 3.5×10^{19} cm^{-3}. However, the room-temperature Seebeck coefficient of -66 μVK^{-1} indicates n-type doping and is lower than that reported for n-type Bi_2Te_3 single crystals at an electron concentration as high as 14.6×10^{19} cm^{-3}. Consequently, the figure of merit is only 0.11 at room temperature, a factor of 7.9 lower than the highest ZT reported for n-type single crystals at the optimized doping level.

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