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Thermoelectric Properties of Higher Manganese Silicide Nanowires ARDEN MOORE, The University of Texas at Austin, JEREMY HIGGINS, University of Wisconsin-Madison, FENG ZHOU, The University of Texas at Austin, SONG JIN, University of Wisconsin-Madison, LI SHI, The University of Texas at Austin — Higher manganese silicides (HMS) have a relatively high thermoelectric figure of merit (ZT) of about 0.7. HMS nanowires have been synthesized using a chemical vapor deposition method. In this work, the thermoelectric properties of individual HMS nanowires are measured and analyzed to determine the role of size effects on electron and phonon transport as well as potential ZT enhancement. Measurements of Seebeck coefficient, electrical conductivity, and thermal conductivity were performed using both suspended and substrate-based microdevices. Results show that the Seebeck coefficient of two as-synthesized 60 nm diameter nanowires between 300-400K is about 25-50% lower than that of single crystal bulk parallel to the c-axis, while the electrical conductivity values are about 25% lower than bulk single crystal in the same direction. The thermal conductivity of one 60 nm diameter nanowire at room temperature was found to be four times smaller than the bulk value along the c-axis. The large reduction in thermal conductivity and small to moderate impact on electrical transport may lead to HMS nanowires with enhanced ZT.

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