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The Study of Zinc Tin Nitride for Possible Thermoelectric and Photovoltaic Applications JOHN W. CENKER, JEFFREY S. DYCK, Physics Dept., John Carroll Univ., ROBERT A. MAKIN, Electrical & Computer Engineering Dept., Western Michigan Univ., NATHANIEL FELDBERG, Physics Dept., SUNY - Buffalo, STEVEN M. DURBIN, Electrical & Computer Engineering Dept., Western Michigan Univ. — Zinc Tin Nitride ($ZnSnN_2$) is the II-IV-V_2 semiconductor analog to the III-V semiconductor Indium Nitride (InN), and the two are predicted to have similar properties that make them attractive for thermoelectric and photovoltaic applications. Replacing the costly and rare indium with more Earth-abundant and inexpensive zinc and tin makes $ZnSnN_2$ a potentially valuable alternative to InN. In this work, temperature dependence of Seebeck coefficient, Hall coefficient, and electrical resistivity were measured in a range of 7-300K. The Hall and resistivity measurements enabled the determination of Hall mobility and carrier concentration. Using the solutions to the Boltzmann transport equations in the relaxation time approximation and assuming a parabolic band, bounds on density of states effective mass are determined corresponding to different possible electron scattering mechanisms. The results show that samples with carrier concentrations in the narrow range 6-9$10^{19}$ cm^{-3} are consistent with the model, but not samples with a higher concentration of 1$10^{21}$ cm^{-3}.

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