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$Gd_{116}Co_{49}Sn_{118}$: A Complex Intermetallic Phonon-Glass/Electron-Crystal[1] DEVIN SCHMITT, NEEL HALDOLAARACHCHIGE, YIMIN XIONG, RONGYING JIN, DAVID YOUNG, JULIA CHAN, Louisiana State University — State-of-the art thermoelectric devices today operate at very low efficiencies and are expensive to produce. However, the growing need for alternate energy sources based on novel technologies has brought thermoelectrics to the forefront of applied materials research. Thermoelectrics could have a significant impact in this area, if their performance is significantly enhanced to a figure of merit (ZT) above 1.5. Our research focuses on the growth and structure-property relationships of intermetallics, specifically crystal structures with large lattice parameters that contain heavy atoms. These materials may be good thermoelectric candidates due to their potentially low lattice thermal conductivities and enhanced Seebeck values resulting from polar intermetallic properties. We have recently grown $Gd_{116}Co_{49}Sn_{118}$ (*Fm-3m*, $a \cong 30.2$ Å), a compound related to the $Dy_{117}Co_{57}Sn_{112}$ structure type. Physical property measurements indicate that this is an ambipolar semiconductor with an exceptionally low lattice thermal conductivity ($\kappa_l \cong 0.5$ W/m-K). The observed phonon-glass/electron-crystal properties make $Gd_{116}Co_{49}Sn_{118}$ and its analogues potential thermoelectric candidates.

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