

DS 32: Invited Johnson

Time: Thursday 9:30–10:15

Location: GER 38

Invited Talk

DS 32.1 Thu 9:30 GER 38

Optimizing Electronic Properties of Misfit Layered Compounds — •DAVID JOHNSON¹, COLBY HEIDEMAN², QIYIN LIN³, and CLAY MORTENSEN⁴ — ¹University of Oregon, Eugene, Oregon, USA — ²University of Oregon, Eugene, Oregon, USA — ³University of Oregon, Eugene, Oregon, USA — ⁴University of Oregon, Eugene, Oregon, USA

Misfit layered compounds are naturally occurring nanostructured solids that have been reported to have low thermal conductivities on the order of 0.8 Wm⁻¹K⁻¹ and unoptimized figures of merit ZT as large as 0.3. We have recently reported thermal conductivity in [(PbSe)_{1.00}m[MoSe₂]_n and [(PbSe)_{0.99}m[WSe₂]_n misfit compounds

as low as 0.06 Wm⁻¹K⁻¹. Here we describe annealing treatments of these misfit compounds in fixed chalcogen partial vapour pressures and demonstrate that samples equilibrate with the dominant source of vapour, resulting in controlled carrier concentrations. The thermal stability of these materials allows annealing times and temperatures in excess of 24 hours and 500° C to be used without destroying the layered structure. We present data showing the convergence of electrical properties for isostructural samples on annealing. In addition to control of carrier concentrations, the annealing treatments dramatically improve the carrier mobility. We report electrical resistivity, Seebeck coefficients and carrier concentrations as a function of annealing conditions.