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Direct measurement of the thin-film thermoelectric figure of merit at high temperatures TELA FAVALORO, JAMES CHRISTOFFERSON, ALI SHAKOURI, University of California, Santa Cruz, GEHONG ZENG, JOHN BOWERS, University of California, Santa Barbara, HONG LU, ARTHUR GOSSARD, Univeristy of California, Santa Barbara — Thin-film and nanostructured materials offer the potential to selectively engineer material properties and improve the thermoelectric figure of merit. Embedded nanostructures can reduce the thermal conductivity and also enhance the power factor via energy-dependent scattering and hot electron filtering. Here, we utilize the transient Harman technique for high temperature characterization of 50 micron thick n-type InGaAs thin films with embedded ErAs nanoparticles to directly obtain the cross-plane thermoelectric figure of merit. These materials have shown to be promising for thermoelectric energy conversion as they have power factors similar to BiTe at room temperature and significantly higher at increased temperatures. To perform transient Harman characterization of thin films, we fabricated novel device structures to reduce parasitic electrical resistance and thermal leakage. We accurately extract the electrical and thermal signals at high temperatures by applying high speed packaging. The surface temperature profile is obtained using high temperature thermoreflectance imaging and is used to identify major parasitics and acquire thermoelectric parameters of the thin film.

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