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Micro- and nanomachined tools for measuring in-plane thermal conductivity of thermoelectric thin films R. RAHMAN, R. SULTAN, F. BASET, B. L. ZINK, University of Denver — Many of the potential next-generation thermoelectric materials being studied are either thin films or nanostructures that are expected to have anisotropic properties. For example, the thermal conductivity of a layered thin film in the plane of the film, $k_{\|}$, is likely to be different from that perpendicular to the layers, $k_{\perp}$. Techniques such as the 3ω method and picosecond thermoreflectance allow accurate measurements of $k_{\perp}$ at temperatures relevant to thermoelectrics, but measuring $k_{\|}$ is often difficult. In this talk we discuss our efforts to design and demonstrate accurate measurements of $k_{\|}$ of thin films from $77-475$ K using micro- and nanomachined thermal isolation platforms. Using thin-film structures to support the thin-film sample reduces background contributions, and careful control of the geometry keeps radiation errors small. We will also discuss plans for a next-generation device that will simultaneously measure thermal conductivity, thermopower, and electrical conductivity of a thin-film or nanostructure, allowing determination of the thermoelectric figure-of-merit, ZT.

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