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Measuring In-Plane Thermal Conductivity of Anisotropic Thin-films MISHA RODIN, SHANNON YEE, Georgia Inst of Tech — Polymer thermoelectrics (TEs) are a promising alternative to traditional TEs due to low cost and scalability. Higher efficiency polymer TEs can be realized by control of in-plane electrical and thermal properties. This specifically requires a non-contact technique that can probe the thermal conductivity of highly anisotropic films. Current conductivity measurements of thin-films rely on periodic heating of a semi-infinite solid. The periodic heating causes surface temperature fluctuations, which depend on the thermal and physical properties of the material. Presented here is our progress in developing a frequency-domain thermoreflectance (FDTR) technique to measure in-plane thermal conductivity of highly anisotropic films. Traditional FDTR uses a circular laser spot for heating and is insensitive to the effects of lateral heat flow. By modifying the heating laser spot from a circle to an annulus, the temperature fluctuations inside the annulus perimeter are significantly influenced by lateral heat flow. The probe laser can scan within the annulus, making this technique sensitive to both the in-plane and through-plane properties. Additionally, this technique can be used at high heating frequencies to measure phonon MFP contributions to the thermal conductivity in both directions.

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