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**Transverse Shear Microscopy: Probing Elastic Anisotropy at Organic Surfaces** VIVEK KALIHARI, Chemical Engg and Materials Science, University of Minnesota, GREG HAUGSTAD, C. DANIEL FRISBIE — We demonstrate that an unconventional mode of lateral force microscopy can distinguish between sliding friction and elastic shear deformation at the surfaces of molecular single crystals. Specifically, when the scan vector is perpendicular to the cantilever axis, as in case of friction force microscopy, the cantilever twists due to torque on the tip resulting from friction forces at the tip-sample interface. However, aligning the scan vector *parallel* with the cantilever axis while still monitoring cantilever twist, a mode we term the transverse shear microscopy, affords improved sensitivity to elastic shear deformation at the crystal surface. Scanning along particular crystallographic directions in the transverse shear mode generates a cantilever torque that can be related quantitatively to the elastic modulus tensor of the crystal. The velocity and temperature dependencies of both the transverse shear and friction signals confirm that the transverse shear response has a fundamentally different physical origin than friction. The ability to image elastic anisotropy at high resolution is useful for microstructural characterization of soft materials, and for relating other physical properties (*e.g.*, optical, thermal or electrical anisotropy) to bonding anisotropy in such systems.

Vivek Kalihari
Chemical Engg and Materials Science, University of Minnesota

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