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Thermal Conductivity of Monolayer Molybdenum Disulfide Obtained from Temperature-Dependent Raman Spectroscopy[1] J.R. SIMPSON, Towson University, R. YAN, Notre Dame, M. WATSON, Towson University, D.B. ROMERO, University of Maryland, A. BRIGGS, NIST, X.G. XING, Notre Dame, A.R. HIGHT WALKER, NIST — Atomically-thin transition metal dichalcogenides (TMDs) offer potential for an alternative to graphene in advanced devices owing to their unique electronic and optical properties. We report the temperature-dependent Raman spectra of the monolayer TMD molybdenum disulfide (MoS_2). Mechanical exfoliation of bulk MoS_2 provides monolayer flakes, which are then transferred to either sapphire substrates (with and without HfO_2 overcoating) or suspended over holes in a Si/Si_3N_4 substrate. The temperature dependence of Raman spectra from (100 to 400) K reveals two strong phonon modes, the planar E^1_{2g} and out-of-plane A_{1g}, both of which soften linearly with increasing temperature as a result of anharmonic effects. We extract a linear temperature coefficient for both Raman-active modes. These data, when combined with the first-order coefficients from laser power-dependent measurements, enable extraction of the thermal conductivity. The resulting room-temperature thermal conductivity, $\kappa = 35$ W m^{-1} K^{-1}, agrees well with first-principles lattice dynamics simulations, however, this value is significantly lower than that of graphene. The impact of the dielectric and substrate environment on extraction of κ will be discussed. Additionally, we will present preliminary Raman spectra of related TMDs, *e.g.*, $TaSe_2$.

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Jeff Simpson
Towson University

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