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Development of Micro-Raman Spectroscopic Instrumentation for Measurement of Novel 2D Materials MICHAEL WATSON, ZACH THOMPSON, Student, JEFF SIMPSON, Professor, TOWSON UNIVERSITY TEAM — Recent research activity in mono-atomic layer graphene stimulates interest in other novel 2D materials, including molybdenum disulfide (MoS_2). Raman spectroscopy, based on the inelastic scattering of light, provides a powerful and high-throughput spectroscopic technique to probe low energy excitations, e.g., phonons, in graphene and related novel 2D materials. The accurate measurement of phonon frequency, especially its sensitive dependence on physical parameters such as temperature, carrier doping, and defects, requires an appropriately calibrated spectrometer. We report on the implementation and calibration of a homebuilt Raman system. Specifically we correlated peak wavelength from known atomic spectral lines with the pixel number detected on a thermoelectrically-cooled CCD camera attached to a grating monochromator. Additionally we developed software to control the grating position and maintain calibration while acquiring spectra. Once calibrated, we interfaced the spectrometer to a microscope to acquire spatial maps of small samples. Single-layer MoS_2 flakes were prepared using the mechanical exfoliation of bulk MoS_2 and transferred to substrates using techniques pioneered in graphene research. Using HeNe and Ar ion lasers for excitation, we measured the Raman spectra of single-layer MoS2 flakes. The temperature-dependence of the observed Raman-active phonons will be discussed.

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