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Nanogap-enhanced Raman spectroscopy of monolayer MoS2[1] XIFAN WANG, Department of Materials Science and NanoEngineering, Rice University, PAVLO ZOLOTAVIN, CHARLOTTE EVENS, DOUGLAS NATELSON, Department of Physics and Astronomy, Rice University — Surface enhanced Raman spectroscopy (SERS) is a common method to obtain vibrational and chemical information of materials. However SERS relies on plasmon excitation in metallic nanostructures to provide large field enhancements under laser illumination. We have fabricated nanogaps located within Au nanowires linking extended electrodes that gives largest SERS enhancements when the incident light is polarized transverse to the nanowire. With this structure, we are able to combine both vibrational spectroscopy and electronic transport measurements, and study the interactions between applied bias voltage and Raman spectra, as demonstrated in C60 and other molecules.. We report extending this approach to examine MoS2, one of the most popular two-dimensional materials. Due to the energy difference between monolayer MoS2 band gap (1.68eV) and 785 nm excitation laser (1.58eV), Raman spectra of monolayer MoS2 are not easily observed by conventional Raman spectroscopy. We find nanogap enhancement of the Raman spectrum of monolayer MoS2, with a polarization dependence consistent with the plasmonic enhancement in the nanogap. We will present preliminary findings of the effects of source-drain and gate bias on such enhanced Raman spectra.

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Xifan Wang
Department of Materials Science and NanoEngineering, Rice University

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