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Propagating plasmon excitation of molecular junctions for spectroscopy[1] CHARLOTTE EVANS, PAVLO ZOLOTAVIN, DOUGLAS NATELSON, Rice University Department of Physics and Astronomy — Electronic transport and simultaneous optical measurements on molecule-containing junctions can provide critical information about the dissipation of energy through inelastic processes. Gold bowtie nanostructures have been used for electronic transport and as plasmonically active substrates for surface-enhanced Raman scattering (SERS), conventionally with exciting light incident directly on the molecular junction. Electromigrating these devices created interelectrode nanogaps with single-molecule sensitivity in which the Raman scattering rate is dominated by plasmonically enhanced electromagnetic fields due to the presence of the metal nanojunction near the molecules of interest. Direct optical excitation of the junction region, however, can cause heating of the metal, molecular instability via conformational and chemical changes, and breakdown over time. Adding metallic gratings to the electrode design enables the excitation of propagating plasmon modes that can couple into the junction region without direct excitation by far-field radiation. We will present preliminary data on how the addition of these gratings affects single-molecule SERS and the electrical properties of the molecules in these junctions.

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