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Gold plasmonic effects on charge transport through single molecule junctions[1] OLGUN ADAK, Department of Applied Physics and Applied Mathematics, Columbia University, New York, LATHA VENKATARAMAN, Department of Applied Physics and Mathematics, Columbia University, New York — We study the impact of surface plasmon polaritons, the coupling of electromagnetic waves to collective electron oscillations on metal surfaces, on the conductance of single-molecule junctions. We use a scanning-tunneling microscope based break junction setup that is built into an optical microscope to form molecular junctions. Coherent 685nm light is used to illuminate the molecular junctions formed with 4,4'-bipyridine with diffraction limited focusing performance. We employ a lock-in type technique to measure currents induced by light. Furthermore, the thermal expansion due to laser heating is mimicked by mechanically modulating inter-electrode separation. For each junction studied, we measure current, and use AC techniques to determine molecular junction resonance levels and coupling strengths. We use a cross correlations analysis technique to analyze and compare the effect of light to that of the mechanical modulation. Our results show that junction transmission characteristics are not altered under illumination, within the resolution of our instrument. We argue that photo-currents measured with lock-in techniques in these kinds of structures are due to thermal effects.

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