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The Interaction of Atomic Hydrogen with Au under Optical Plasmonic Excitation CHRISTOPHER LANE, Northeastern U., DEVIKA SIL, Temple U., ETHAN GLOR, UPenn, KYLE GILROY, Temple U.,Georgia Tech, SAFIYA SYLLA, Temple U., B. BARBIELLINI, R.S. MARKIEWICZ, Northeastern U., SVETLANA NERETINA, Temple U., ARUN BANSIL, Northeastern U., ZAHRA FAKHRAAI, UPenn, ERIC BORGUET, Temple U. — The interaction of Au with hydrogen, especially the formation of Au-H bonds, is far from being understood due to the inert nature of bulk Au. Since the Au is non-reactive, thermodynamics alone cannot drive the dissociation of H_2 due the large activation energy of 4.51 eV, leaving the difficult task to find methods to facilitate gold hydride formation. However, when irradiated with low intensity visible photons, nanometer sized gold structures produce localized surface plasmons, which decay into hot electrons able to dissociate H_2 molecules at the surface. Experimentally we find as a result of the dissociation reaction a change in the optical properties of the Au nanostructures, manifest as a blue-shift in the dielectric function. We will present work, wherein we combine the results of density functional theory (DFT) and insitu-spectroscopic ellipsometry, to justify the proposed mechanism of the blue-shift based on gold hydride formation, where the coverage of the hydride formation is directly proportional to the blue shift. We will also provide unique insights on the interaction of Au nanoparticles with atomic hydrogen. Work supported in part by the US Department of Energy.

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