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Buried silver nanoclusters on TiO_2(110) for photocatalysis
FEI WANG, FRANK WOMACK, ASOKA SEKHARAN, Department of Physics and Astronomy, Louisiana State University, BRENDAN WASTON, PHILLIP SPRUNGER, RICHARD KURTZ, Department of Physics and Astronomy, Louisiana State University, LSU CAMD COLLABORATION — Ag nanoclusters grown on TiO_2(110) can promote photochemistry by enhancing photoabsorption via their plasmon resonances. Overcoating the Ag clusters with a thin layer of titania red-shifts the plasmon to better match the solar spectrum and protects the nanoclusters from the environment. Our STM studies show that Ag clusters $\sim$5nm across and 2nm high nucleate on the TiO_2(110) surface at room temperature. Photoemission performed at the LSU CAMD synchrotron shows that the clusters interact weakly with the substrate, although there is charge transfer from surface defects to the first nanoclusters that nucleate. EELS shows that the bare clusters exhibit a plasmon resonance located at 3.8 eV. Ti overgrowth and subsequent oxidation gives rise to new losses at about 1.5eV as observed in EELS. We will discuss our work at incorporating the nanoclusters within the titania matrix in light of their potential for producing hot electron-hole pairs for surface chemistry.

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