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TMAA surface-molecule photon interactions on Au-supported TiO_2 nanocrystals RICHARD OSGOOD, DENIS POTAPENKO, ZHISHENG LI, Columbia University — Nanostructured titanium dioxide is a versatile photocatalytic material. While its photocatalytic properties have been extensively studied in liquid/gas-phase environments, studies of the physics of photoinduced dynamics and reactions on bare well characterized titania nanoparticles using surface science tools have been lacking. Here we explore these photoinduced properties of TMAA-dosed TiO_2 nanocrystals prepared in situ on Au(111) substrate with Scanning Tunneling Microscopy (STM) and Temperature Programmed Desorption (TPD). Photodesorption of trimethyl acetic acid was chosen as a model for light-driven reaction dynamics since it is easily imaged with STM and since this system has been the subject of many earlier studies. For comparison, we explored dynamics of TMAA on TiO_2 rutile(110) by exposing it to monochromatized UV light and by injecting charges from the STM tip. We then demonstrated that 1–3 nm high and 10–25 nm wide nanocrystals of TiO_2 grown on Au(111) surface also exhibit photoreaction activity for TMAA when illumined with UV light. TPD results, which provided surface-averaged information, agree well with STM data and demonstrate TMAA desorption on a single-molecule basis.

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