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Size-Selected Au_n and Ag_n Nanoclusters on Rutile $\text{TiO}_2(110)\text{-}1\times 1$ Surfaces Probed by UHV-STM.¹ STEVE BURATTO, XIAO TONG, LAUREN BENZ, STEEVE CHRETIEN, PAUL KEMPER, HORIA METIU, MICHAEL BOWERS, University of California, Santa Barbara — Catalysis of the oxidation of CO and small olefins by Au_n and Ag_n nanoclusters on oxide supports is known to be strongly dependent on the size of the cluster and its interaction with the oxide surface. In our group we have probed this size dependence by depositing size-selected clusters of Ag_n^+ and Au_n^+ ($n = 1\text{-}7$) from the gas phase onto single crystal rutile $\text{TiO}_2(110)(1\times 1)$ surfaces at room temperature under soft-landing (< 2 eV/atom) conditions. We analyze the clusters on the surface using ultra-high vacuum scanning tunneling microscopy (UHV-STM) and compare the resulting structures with theory. In the case of Au_n^+ , Ag^+ and Ag_2^+ clusters deposited under soft-landing conditions we observe large, sintered clusters indicating high mobility for these species on the surface. For Au_n^+ ($n \geq 2$) and Ag_n^+ ($n \geq 3$) clusters deposited under soft-landing conditions, however, we observe a high density of intact clusters bound to the surface and no sintered clusters indicating that these species have very limited mobility on the surface. For the intact clusters we can also observe the binding site and geometry of the cluster in the STM image and compare these with structures calculated using density functional theory (DFT) as well as with structures observed in the gas phase.

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