

## **The unusual chemical properties of Au atoms and clusters deposited on ultra-thin oxide films**

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Au clusters deposited on oxide surfaces exhibit specific chemical and catalytic properties often connected to their low dimensionality. One aspect that can deeply modify the properties of supported metal clusters is the occurrence of charge transfers at the metal-oxide interface. Charged clusters, and in particular cluster anions, are expected to be catalytically more active than their neutral counterparts. Charging mechanisms of gold on oxide surfaces and thin films is the topic of this talk. Using high quality DFT calculations in combination with direct experimental spectroscopic measurements, we will discuss in which conditions charging occurs and how to measure it. We will show unexpected results when CO is used as a probe molecule to determine the charge of an adsorbed Au atom on MgO(100). The properties of Au atoms and clusters adsorbed on MgO, SiO<sub>2</sub>, and TiO<sub>2</sub> single crystals will be compared with those of the same species deposited on ultra-thin oxide films. We will show that charging of the deposited cluster is not exclusively connected to the existence of point defects at the oxide surface. In fact, by tuning the work function of the metal/oxide interface one can prepare substrates where charging of Au atoms and clusters occurs by direct electron tunneling through an ultra-thin oxide film epitaxially grown on a metal single crystal. In this respect, ultra-thin oxide films may behave differently from the corresponding single crystal surfaces. For instance, Au<sub>20</sub> assumes a different shape when deposited on the MgO(100) surface or on a MgO/metal thin film.