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Catalytic Gold Nanoparticles on an Iron Oxide Surface: A Scanning Tunneling Microscopy/Spectroscopy Study KWANG TAEG RIM, DAE-JIN EOM, LI LIU, ELENA STOLYAROVA, JOAN RAITANO, SIU-WEI CHAN[1], Columbia University, MARIA FLYTZANI-STEPANOPOULOUS, Tufts University, GEORGE FLYNN, Columbia University — We present a Scanning Tunneling Microscopy/Spectroscopy study of a model catalyst system consisting of supported gold nanoparticles on a reduced $Fe_3O_4(111)$ surface in ultrahigh vacuum. Gold forms two electrically distinct types of nanoparticles on an iron oxide surface upon annealing a multilayer $Au/Fe_3O_4(111)$. STS measurements show that large nanoparticles ($\sim$8nm) are metallic while single gold adatoms are bonded to the oxygen sites on the $Fe_3O_4(111)$ surface. Site-specific adsorption at oxygen surface atoms and the size sensitive nature of the electronic structure (Coulomb blockade) suggest that Au adatoms are positively charged. When this $Au/Fe_3O_4(111)$ catalyst system is dosed with CO at 260K, there is evidence for CO adsorption at gold adatom sites. These observations are consistent with the proposal that nonmetallic, positively charged, "invisible" Au particles are the catalytically active species for the water-gas-shift reaction on Au/metal oxide surfaces. http://clippercontrols.com/info/dielectric_constants.html

[1]swcnyc@gmail.com

Kwang Taeg Rim
Columbia University

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