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Multiscale Studies of Surface Chemistry of Catalysis: Au-Ag alloys

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Multiscale studies of gold-based materials spanning materials complexity and gas phase pressure demonstrate the predictive value of fundamental studies for selective oxidative transformations of organic oxygenates (alcohols and aldehydes) on gold-based materials. Model studies on single crystal surfaces under ultrahigh vacuum are used to understand surface structure and reaction mechanism on a molecular scale. The model studies use a combination of spectroscopy and imaging with scanning tunneling microscopy. The principles are derived from these used as a basis for predicting and understanding reactivity on complex, nonporous gold catalysts under steady-state conditions pressure. These nonporous materials are Au alloys with $\sim$3% Ag. This work illustrates the predictive value of model studies and the potential for improving reaction selectivity in important catalytic reactions.