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Kinetics of Low-temperature CO Oxidation on Au(111)

by

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Abstract

The oxidation of carbon monoxide on oxygen-modified Au(111) surfaces is studied using a combination of reflection-absorption infrared spectroscopy (RAIRS) and temperature-programmed desorption (TPD). TPD reveals that CO desorbs in two states with the low-temperature state have a peak temperature between ~130 to 150 K, and the higher-temperature state having a peak temperature that varies from ~175 to ~220 K depending on the initial oxygen and CO coverages. Infrared spectroscopy indicates that the low-temperature CO desorption state is predominantly associated with CO adsorbed on $Au^{\delta+}$ sites, while the higher-temperature states are due to CO on Au^0 sites. No additional vibrational features are detected indicating that CO reacts directly with adsorbed atomic oxygen on gold to form CO_2. Estimates of the activation energy for CO_2 formation suggest that they are in the same range and found for supported gold catalysts at reaction temperature below ~300 K.

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