Modification of the Electrical Resistance of Thin Cobalt Films Upon the Adsorption of Carbon Monoxide

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Abstract

Thin films of pure Co with thicknesses ranging between 10 and 50 nm were produced in UHV conditions. The films were deposited onto mica substrates with dimensions of 1 cm×1 cm×0.1 cm. Thin gold wires were attached to the ends of the films in order to monitor their electrical resistivity. The films were introduced into a UHV chamber which consists of a quadrupole mass spectrometer and an Arsputtering gun for cleaning. The films were exposed to 10^{-6} torr of high-purity CO and the resistivity of the films was monitored during exposure. The resistivity changed in a “sawtooth” fashion similar to the changes observed by Pick in the Nb/H_2 system. The aim of these studies is to correlate changes in resistivity of the film with well-characterized adsorption states of CO on the Co surface. Carbon monoxide desorption from the cobalt films was studied (using a mass spectrometric method in an ultrahigh vacuum system) and two carbon monoxide desorption peaks were observed identical to prior work using Co foils. These two states correspond to molecular CO and presumably dissociated CO. Changes in resistivity of the thin Co films appear to be related only to the molecular CO adsorbed on the Co surface.