Surface roughness and size effects of thin gold films on mica

Munoz, Raúl C.

Concha, Andres

Mora, Fernando

Espejo, Roberto

Vidal, Guillermo

Mulsow, Marcelo

Arenas, Claudio

We report measurements of the topography of a gold film deposited on a mica substrate using scanning tunneling microscope (STM), and measurements of the conductivity ? of the film performed between 4 and 300 K. From images obtained with the STM running in air in the constant current mode of a gold sample 70-nm-thick deposited under UHV on a mica substrate preheated to 300 °C, we compute the average autocorrelation function (ACF) that characterizes the surface of the film in the scale of (Formula presented) and determine by least-squares fitting the parameters ? (rms. amplitude) and ? (lateral correlation length) corresponding to an exponential that best describes the average ACF data. Using an exponential representation of the ACF, the parameters ? and ? determined from STM measurements, and a modified version of the theory of Sheng, Xing, and Wang recently proposed [R. C. Munoz et al., J. Phys.: Condens. Matter 11, L299 (1999)], we calculate the temperature dependence of the bulk resi