Surface roughness and surface-induced resistivity of gold films on mica: Influence of roughness modelling

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We report measurements of the temperature dependent resistivity ?(T) of a gold film 70 nm thick deposited on mica preheated to 300°C in UHV, performed between 4 K and 300 K, and measurements of the surface topography of the same film performed with a scanning tunnelling microscope (STM). From the roughness measured with the STM we determine the parameters ? (r.m.s. amplitude) and ? (lateral correlation length) corresponding to a Gaussian and to an exponential representation of the average autocorrelation function (ACF). We use the parameters ? and ? determined via STM measurements to calculate the quantum reflectivity R, and the temperature dependence of both the bulk resistivity ?0(T) and of the increase in resistivity ??(T) = ?(T) - ?0(T) induced by electron-surface scattering on this film, according to a modified version of the theory of Sheng, Xing and Wang recently proposed (Munoz et al 1999 J. Phys.: Condens. Matter 11 L299). The resistivity ?0 in the absence of surface scatterin