

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

Influence of the theoretical modelling of electron-surface scattering

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We analyze the thickness and temperature dependence of the resistivity for several gold films on mica reported by Sambles, Elsom and Jarvis. Data analysis proceeds according to an iteration procedure proposed recently, that permits the calculation of the temperature-dependent bulk conductivity $\rho_0(T)$ from the parameters σ (r.m.s. roughness amplitude) and λ (lateral correlation length) that describe the surface roughness. To assess the influence of the theoretical modelling of the electron-surface scattering, we use the theory of Tesanovic, Jaric and Maekawa (TJM), the theory of Trivedi and Aschroft (TA) and the modified theory of Sheng, Xing and Wang (mSXW). With the parameters σ and λ measured for a 70 nm gold film deposited on mica, under similar conditions of evaporation, all three models reproduce approximately the thickness and temperature dependence of the resistivity (between 4 K and 300 K) of the SEJ films without using any adjustable parameter. Agreement between theory and exp