Surface-induced resistivity of thin metallic films bounded by a rough fractal surface

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We have extended the modified formalism of Sheng, Xing, and Wang [J. Phys.: Condens. Matter 11 L299 (1999)] to allow the calculation of the conductivity of a thin metallic film bounded by a rough fractal surface. We utilized the so-called k-correlation model proposed by Palasantzas and Barnas [Phys. Rev. B 48, 14 472 (1993); 56, 7726 (1997)], to describe the height-height autocorrelation function corresponding to a self-affine roughness. This extension permits the calculation of the conductivity of the film as a function of the r.m.s. roughness amplitude ?, of the lateral correlation length ?, of the mean free path in the bulk l, and of the roughness exponent H. We found that the degree of surface irregularity, represented by the roughness exponent H characterizing the surface, does influence the conductivity of the film, as first discovered by Palasantzas and Barnas. However, this influence manifests itself for large bulk mean free paths (formula presented) and for large correlation l