Electronic Properties of the Si(557):Au Surface

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Submonolayer coverages of metals on vicinal Si surfaces exhibit nanostructures on the atomic level. For instance, monatomic chains of Au-atoms are observed after evaporation of Au on Si(111) with an intentional miscut to the $< -1 - 12 >$ direction in ultra-high vacuum. This Si(557):Au surface is being controversally discussed due to its unusual electronic properties which are assigned to the quasi-one-dimensional structure. Recent angular-resolved photoemission spectroscopy (ARPES) data are explained by the existence of two nearly-degenerate metallic surface-state bands [1], while earlier ARPES measurements were interpreted as indications for spin-charge separation in a Luttinger liquid [2].

We report on the electronic properties of these surfaces investigated by means of scanning tunneling spectroscopy and first resistance measurements. Tunneling spectra taken on or off the distinct chainlike structures of the surface show strong differences due to the lateral variation of the local surface density of states. Resistance measurements between contacts evaporated onto the surface were performed *in situ* for temperatures $T = 1.8 - 300$ K. In all cases, the resistance measured with the current along the chain-structure is increasing with decreasing temperature, i.e. nonmetallic behaviour is found. Several reasons for this behaviour, such as activated hopping between chain fragments or the electronic structure of the surface, are discussed.

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