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STM/STS investigations of Au (111)surface state position at high temperature

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Scanning tunneling microscopy (STM) and spectroscopy (STS) were used to study electronic structure of Au (111)surface in the range of 0 – 1 eV below the Fermi level. In this paper we concentrate firstly on temperature influence on the position of the Shockley surface state (SS) located in the band gap existing in [111] direction which is typical for noble metals and secondly on temperature influence on the lower band edge (BE). The experiment was carried out in UHV with Omicron VT STM/AFM at five temperatures: 294 K, 370 K, 430 K, 480 K and 580 K.

Our high temperature STS (HT-STS) results clearly show the presence of SS and BE local maxima at all temperatures. What is more, a slight shift towards the Fermi level of both maxima was observed. In our opinion two effects have to be taken into account. It is the apparatus effect related to the Fermi function contribution to the tunneling current and the physical effect related to the change of band gap due to the change in the distance among atoms at high temperature. Our experimental results are compared to a simple theoretical model of HT-STS based on Thersoff and Hamann theory.

Electron transport through a strongly correlated monoatomic chain

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We study transport properties of a strongly correlated monoatomic chain coupled to metallic leads. Our system is described by tight binding Hubbard-like model in the limit of strong electron-electron interactions in the wire. Nonequilibrium Keldysh Green function approach in slave boson representation has been applied to obtain analytical and numerical results. Calculated linear conductance of the system shows oscillatory behavior as a function of the wire length. This effect can be explained in terms of the local density of states in the wire. We have also found and discuss oscillations of the local and average electron charge in the system. Finally, we compare our results with those for non-interacting chain and discuss their modifications due to the Coulomb interactions in the system.

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