SF-005

Negative Differential Resistance in a Tip-induced Quantum Well Potential on Si(001) Surface

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We report on the zero-dimensional quantum well states on a Si(100) surface, the outcome of local band-bending induced by the electric field between the STM tip and the surface. Scanning tunneling spectroscopy data of the bulk band gap region exhibit a multitude of the negative differential resistance (NDR) peaks, strongly indicating the existence of the atom-like high density states. Each NDR peak corresponds to an energy level of the quantum well state because the tunneling current is enhanced when the localized tip state is in resonance with the quantum well state. It is also found that under higher tunneling current, the NDR's shift to the higher binding energy, in agreement with the behavior of the quantum well under the external electric field provided by the STM tip. The role of the quantum well states in the creation of bisolitons by fast field switching conditions will be discussed.

SF-006

Intra-row Adsorption Configuration of Glycine on Ge(100)

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The adsorption structures of glycine on Ge(100) were investigated using scanning tunneling microscopy (STM), density functional theory (DFT) calculations, and high-resolution core-level photoemission spectroscopy (HRCLPES). We found three distinct adsorption features of glycine on Ge(100) in the STM images, consisting of one major feature and two minor features. The major feature appeared as a bright protrusion between two dimer rows with a dark adjacent dimer. The position of the bright protrusion located in the middle of the two dimer rows indicates a multibonding adsorption structure. The results of the theoretical calculations confirm that the major adsorption structure of glycine on Ge(100) (among two possible multibonding adsorption structures) is an 'intra-row O – H dissociated and N dative bonded structure'. We also defined two minor adsorption structures as 'inter-row O – H dissociated and N dative bonded structure' and 'N dative bonded structure'. In the HRCLPES experiments, we found an N 1s peak (at 399.5 eV) and two O 1s peaks (at 531.1 and 532.0 eV), which represent strong evidence that the major feature of glycine on Ge(100) is an 'O – H dissociated and N dative bonded structure'. All our STM, DFT, and HRCLPES results suggest that the major adsorption structure of glycine molecules on Ge(100) is an 'intra-row O – H dissociated and N dative bonded structure' whereas the minor adsorption structures are an 'inter-row O – H dissociated and N dative bonded structure' and an 'N dative bonded structure'.