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Study of Water Adsorbed on the Cu(110) Surface using Scanning Tunneling Microscopy and Electron Stimulated Desorption Ion Angular Distribution

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The structure of water layer on the Cu(110) surface formed via hydrogen bonding has been investigated with scanning tunneling microscopy (STM), electron stimulated desorption ion angular distribution (ESDIAD), and density functional theory (DFT) calculations. STM results revealed 1D chain and 2D island growth at low temperature ($\sim$80 K) and at low coverage regime. ESDIAD results at low coverage indicate that there are two kinds of O-H bonds of water molecules that are pointing out of the surface plane. At higher coverage the two-dimensional islands of water prevail, eventually covering the whole surface at the saturation coverage. Dynamic changes in the structure of the water layer and the local O-H bond direction have also been investigated as a function of annealing temperature. Using DFT calculation, a model of the 1D chain structure will be presented.