

SELF-ORGANIZED SUBMONOLAYERS OF S-CYSTEINE ON Au(111)

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Understanding the interaction of biomolecules on metal surfaces is an issue of relevance due to the wide number of scientific and technological areas in which they are involved. Among them, biosensors, biomaterials, biocatalysis and biocompatibility. Due to its simple structure, amino-acids can be used as a good model system to study biomolecule-surface interaction, which can indeed assist in the understanding of more complex systems. In addition, it has been found that a number of amino-acids self-organise to form well ordered two-dimensional structures at metal surfaces [1]. The local adsorption geometry and the two-dimensional self-assembly of *S*-cysteine are of particular interest because it is the only amino-acid having a thiol side group. Previous studies on Cu(110) surface have shown the interaction of cysteine-metal through the COO⁻ and SH- group [2]. It is well-known the affinity of thiol groups for noble metals, therefore, cysteine can be used as a bonding group for self-assembled monolayers formation.

The adsorption of cysteine on Au(111) at submonolayer coverage has been studied and characterized by means of scanning tunnelling microscopy (STM), X-ray photoemission spectroscopy (XPS) and ultraviolet photoemission spectroscopy (UPS). XPS data shows the adsorption of the zwitterionic form of *S*-cysteine molecule on Au(111) surface. Meaning the desprotonation of the carboxylic group (COO⁻) and the protonation of the amino group (NH₃⁺). Furthermore, the interaction of the amino acid on the surface goes through the COO⁻ and the thiol group (S-Au), which is the anchoring point of the molecule. The STM characterization performed under UHV conditions at room temperature reveals an structural evolution on time of the Cys/Au(111) system. Just after cysteine dosing at room temperature, the diffusion of molecules on the surface is very high. These diffusing molecules coexist with molecular islands without any internal order mainly anchored at the step edges and with long ordered molecular rows (fingers). After a period of time, the long molecular rows (fingers), evolve to develop ordered molecular network of *S*-cysteine islands. The row separation is 12 Å, in good agreement with previous works[3]. An example of this growth is shown in figure 1. By means of video-STM at different coverages we show that the self-organized molecular island formation is related to the vanishing of the disordered areas due to surface diffusion. Annealing of the cysteine covered substrate to 380 K leads to a new ordered structure.

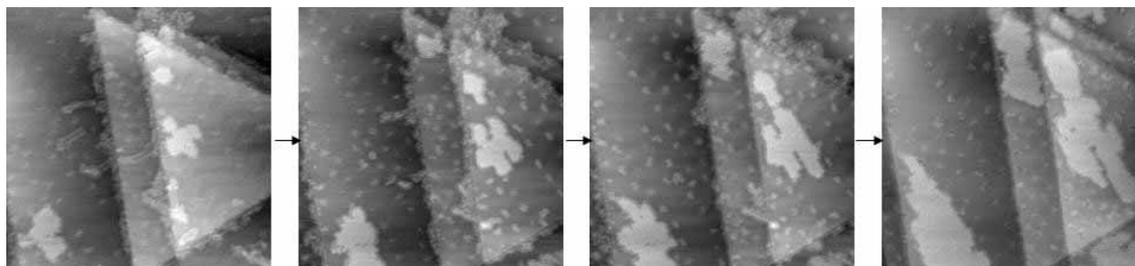


Figure 1: subsequent series of STM images of *S*-cysteine adsorbed on Au(111) surface, where the growth of the islands is observed.

Referencias:

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