Understanding the bio-interface at the nanoscopic level: amino acids adsorption at Ag surfaces

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Adsorption and self-assembly of (bio)-organic molecules at surfaces is a key issue in nanoscience and nanotechnology for the many possible uses of the hybrid organic-inorganic interfaces. Depending on the nature of the molecules, applications are foreseen in the fields of molecular electronics, sensoristics, pharmacology, bio-compatibility, hygiene and bio-fouling.
In this frame, amino acids (AA) have a key role since they are the basic constituents of peptides and proteins and are simple enough to bring information on the chemical interaction of some biological functions with the surface. They are therefore among the most used molecules in fundamental studies aiming at the characterization of the hybrid organic-inorganic interface at the molecular level [1].

In my talk, I will discuss our recent results on AA adsorption at Ag surfaces. The self-assembly of glutamic acid and of cysteine molecules on different Ag substrates [1] is described by combining microscopic and spectroscopic techniques with density functional theory calculations. Particular attention is given to the determination of the chemical state of the adsorbed molecules, to the explanation of the observed geometries and to the understanding of the self-assembly mechanism [2,3]. Both glutamic acid and cysteine layers organize on Ag surfaces in different phases depending on surface temperature, suggesting the existence of several local minima in the energy diagram of these systems [4,5]. The peculiarities introduced by the weak interaction with a poorly reactive substrate are critically discussed by comparison with literature cases.

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