4,4'-BIPYRIDINE SELF-ORGANIZATION ON Au(111) AND Ag(100) PROBED BY STM

Antonela Marele, J.M. Gómez-Rodríguez and C. Polop
Departamento de Física de la Materia Condensada, C-III
Universidad Autónoma de Madrid, E-28049-Madrid
antonela.marele@uam.es

Abstract

An important issue in the nanotechnology of molecular devices is the detailed understanding of the atomic structure of organic/inorganic interfaces. In particular, 4,4'-Bipyridine (BiPy) is widely used in chemistry, material and electronic research. For example, BiPy is a popular bridge ligand in coordination chemistry and is useful in fabricating nanoelectronic circuits. BiPy-metal complexes show interesting photochemical properties, which makes them suitable for applications in solar energy conversion. Several AFM and STM studies on the deposition of BiPy from solution on Au, Cu or HOPG surfaces have been reported [1-3]. However, adsorption of BiPy from the vapour phase has not been explored so far.

In this work we have investigated the adsorption of BiPy molecules on Au(111) and Ag(100) at submonolayer coverage by means of Scanning Tunneling Microscopy (STM) in ultrahigh vacuum (UHV). The deposition of submonolayer coverage of BiPy on both substrates at room temperature leads to the formation of large ordered domains with a square structure whose parameters are very similar (Figure 1 and Figure 2). This result points to that the interaction between molecules drives the formation of the self-organized structures. While the structure BiPy/Au(111) presents rotational domains, we observe a single BiPy domain on Ag(100) surface. We propose an atomic scale model for the self-organized structures of BiPy on Au(111) and on Ag(100).

References:

[1] D. Mayer, Th. Dretschkow, K. Ataka, and Th. Wandlowski, J. Electroanal. Chem. **524** (2002) 20.
[2] Y.X. Diao, M.J. Han, L.J. Wan, K. Itaya, T. Uchida, H. Miyake, A. Yamkata, and M. Osawa, Langmuir **22** (2006) 3640.
[3] M. Li, Y.L. Yang, K.Q. Zhao, Q.D. Zeng,, and C. Wang, J. Phys. Chem. C **112** (2008) 10141.

Figures:

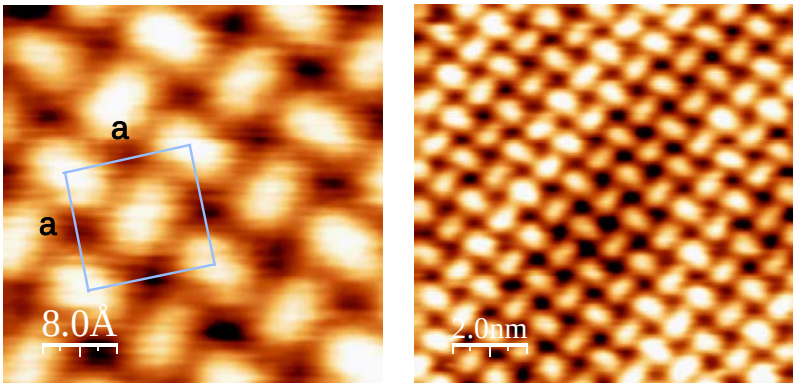

Fig. 1. STM topographs of 4,4' -Bipyridine on Au(111).

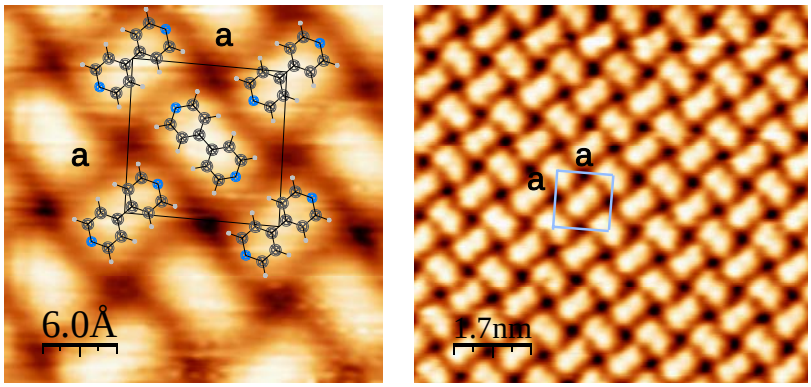

Fig. 2. STM topographs of 4,4' -Bipyridine on Ag(100) surface.