STM study of the TiO_2(110)-(1x2) surface reconstruction

C. Sánchez-Sánchez, J. Mendez, P. L. de Andrés, M. Blanco-Rey, M .F. López and J.A. Martin-Gago (gago@icmm.csic.es)

Instituto de Ciencia de Materiales de Madrid (CSIC), Cantoblanco 28049 Madrid, Spain.

The study of the metal oxide surface is of a great scientific interest due to their huge technological applications. In particular, the rutile TiO_2 has been the subject of numerous investigations since it is relevant for a wide variety of fields, ranging from catalysis to fundamental chemistry. Amongst the different surfaces of the single-crystalline TiO_2 system, the (110) face is the most stable one being its 1x1 structure extensively studied in the last decades. This well-known (1x1) structure transforms into a long ordered reconstruction with a (1x2) symmetry after reducing the TiO_2(110) surface by annealing up to about 800ºC. The understanding of the basic properties of the non-stoichiometric (1x2) TiO_2(110) reconstruction is still nowadays unclear. Recently, the atomic configuration of the 1x2 TiO_2(110) surface has been elucidated by combining scanning tunneling microscopy (STM), quantitative LEED and density functional theory (DFT) [1]. The resulting model consists of added Ti_2O_3 rows along the [001] direction in agreement with a previous proposal by Onishi et al [2].

In the present work, the non-stoichiometric (1x2) TiO_2(110) reconstruction was studied by STM and scanning tunneling spectroscopy (STS). The recorded images show monoatomic steps, wide terraces and no cross-link features as it can be observed in Figure 1. STS current-voltage curves were recorded to obtain information on the local density of states (DOS).

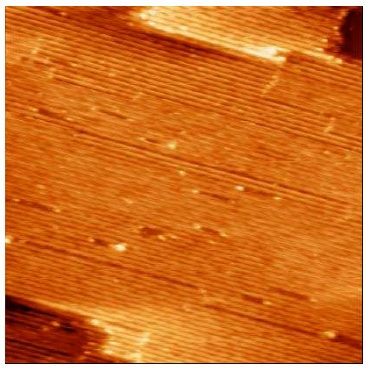

Figure 1: STM image of the 1x2 TiO2 (110) surface reconstruction

Keywords: Scanning Tunnelling microscopy, titanium oxide

References:

[1] M. Blanco-Rey, J. Abad, C. Rogero, J. Mendez, M. F. Lopez, J. A. Martin-Gago and P. L. de Andres, Phys. Rev. Lett. 96 (2006) 055502.

[2] H. Onishi, K. I. Fukui and Y. Iwasawa, Bull. Chem. Soc. Jpn. 68 (1995) 2447.

Topic: Surface Science