Highly Resolved Non-contact Atomic Force Microscopy Images of the Sn/Si(111)-(2√3×2√3) Surface

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When Sn is deposited on atomically clean Si(111)-(7×7) surface, various surface structures can be obtained depending on the initial Sn coverage and the subsequent annealing temperature. One of these surface reconstructions is the Sn/Si(111)-(2√3×2√3), which could be obtained by depositing about one monolayer of Sn followed by an annealing at 930K. From scanning tunneling microscopy (STM) studies performed on this surface, it has been reported atomically resolved images in which four protrusions per (2√3×2√3) unit cell were observed. According to those observations, supported by complementary data to the STM measurements, various structure models have been proposed [1-3]. In this contribution we show, however, that when imaging the Sn/Si(111)-(2√3×2√3) surface with non-contact atomic force microscopy (NC-AFM), quite different atomically resolved images from the STM ones are obtained. Surprisingly, in highly resolved NC-AFM images of this surface more than four protrusions per unit cell are clearly and routinely obtained, as it can be seen in Fig.1. A detailed discussion regarding the structural models proposed for the Sn/Si(111)-(2√3×2√3), their relation with the observed NC-AFM images, and a tentative explanation for the tremendous difference between the atomically resolved NC-AFM and STM images of the same surface will be presented.

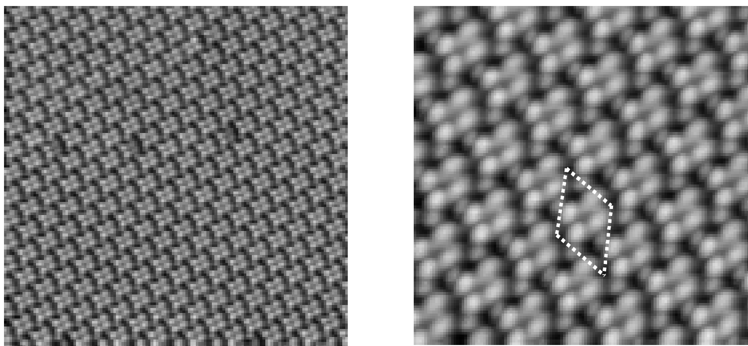

Fig. 1:
NC-AFM topography images of the Sn/Si(111)-(2√3×2√3). In the right image a unit cell of the surface is indicated for clarity. Experimental parameters: (19.4×19.4) nm^2 left and (6.4×6.4) nm^2 right, respectively,

[1] C. Tornevik *et al.*, Phys Rev. B **44**, 13144 (1991)
[2] A.H. Levermann *et al.*, Appl. Surf. Sci., **104-105,** 124 (1996)
[3] T. Ichikawa and K. Cho, Jpn. J. Appl. Phys. **38**, 6851 (1999)