

Séminaire SOLEIL

STM and Photoelectron spectroscopy Studies of Si(111) and Ge(111) surfaces: Clean and modified by H or Sn atoms

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Different semiconductor materials are the subjects of considerable research because of their importance for the manufacture of electronic components. Silicon (Si) in the crystalline form has long been the dominant material. For semiconductors, such as Si and Ge, changes of the atomic structure of the outermost atomic layers are accompanied by changes in electronic properties. For example, the surface can either be conducting or semiconducting. Hydrogen plays a significant role in surface science, specifically in passivating dangling bonds of semiconductor surfaces. There has been a significant number of studies performed on hydrogen exposure of the Si(111)7x7 surface. However, most studies were done after higher exposures resulting in a 1x1 surface. In our work, low hydrogen exposures were employed such that the 7x7 structure was preserved. STM images revealed that the hydrogen atoms preferentially adsorb on the rest atoms at elevated temperatures. A hydrogen terminated rest atom dangling bond is no longer visible in the STM image and the surrounding adatoms become brighter. This implies that there is a charge transfer back to the adatoms. Three types of H-termination (1H, 2H and 3H) were studied in detail by analysing the line profiles of the apparent heights. Also, Sn/Ge(111) has attracted a lot of attention from the surface science community because of the interesting phase transition from the RT-($\sqrt{3}\times\sqrt{3}$) phase to the LT-(3x3) phase. There have been different models proposed for the Sn/Ge(111)3x3 structure such as the 2U1D, 1U2D and IDA models. In our work the LT STM images of the 3x3 surface were investigated and they showed that there are different types of Sn atoms such as up and down atoms. A histogram of the apparent height distribution revealed two peaks, a sharper peak associated with the up atoms and a broader peak for the down atoms. The height distribution was used to produce simulated Sn 4d core-level spectra and the line shape was compared to that of experimental spectra.

Formalités d'entrée : accès libre dans l'amphi du Pavillon d'Accueil. Si la manifestation a lieu dans le Grand Amphi Soleil du Bâtiment Central, merci de vous munir d'une pièce d'identité (à échanger à l'accueil contre un badge d'accès).

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