【S-08】 젊은진공과학자상 후보

# Atomic Structure of Bi-dimer Row Selectively Adsorbed on Si(5 5 12)

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In order to understand the atomic structure of nanostructures self-assembled on the template with one-dimensional symmetry, Bi/Si(5 5 12) system has been chosen and Bi-adsorption steps are studied by STM. The Bi-adsorbed Si(5 5 12) is transformed to (337) terrace with disordered boundary due to mismatched periodicities between (337) and (5 5 12), and Bi-dimer rows are formed inside the (337) unit as follows : Initially, arriving Bi atoms *selectively replace Si-dimer and Si-adatom*, which are loosely bound to the substrate, to form adsorbed Bi-dimer and Bi adatom, respectively. Such replaced Bi-adsorbate *applies the tensile stress to the neighboring* (337) section due to the size and bond-length differences between Si and Bi-adsorbates, which causes structural transformation of tetramer row to dimer/adatom rows. Then the same Bi-replacement occurs in this transformed (337) section. If additional Bi is supplied, the added Bi-dimers adsorb on the Bi-dimers and Bi-adatoms in the first layer. These adsorbed dimers in the second layer are facing each other to *form a Bi-dimer pair with relatively stable* $p^3$ *bonding*. Finally, a single Bi-dimer adsorbs above the Bi-dimer pair in the second layer, and saturates. It has been concluded that the Bi-dimer pair with stable $p^3$ bonding is the composing element in the second layer and such site-selective adsorption is possible due to the substrate-strain relaxation through inserting Bi-buffer layer limited to the specific site of substrate.