Atomic and Electronic Structures of 6H-SiC(1120) Surface

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Abstract

The atomic and electronic structures of the non-polar 6H-SiC(1120) surface are investigated by high-resolution medium energy ion scattering (MEIS) combined with photoelectron spectroscopy (PES) with synchrotron-radiation light. The present MEIS analysis has revealed that the surface has a Si-adlayer of 0.5 ML (1 ML = 1.49 \times 10^{15} \text{ atoms/cm}^2) as the top most layer and the 2nd-layer consisting of Si and C is rumpled significantly. The inter-planar distance between the 2nd- and 3rd-layer Si-planes is expanded by 0.026\pm 0.02 \text{ Å} and in contrast the inter-planar distance between the 2nd- and 3rd-layer C-planes is contracted by 0.021\pm 0.02 \text{ Å}. The observed Si-2p core level spectra consist of the bulk (B) and three surface-shifted components (S_1, S_2, and S_3), whose binding energies are 100.8\pm 0.1, 99.5\pm 0.1, 100.3\pm 0.1, and 101.2\pm 0.1 eV, respectively. Two surface-shifted components labeled S_1 and S_2 are assigned to the Si-adlayer and the 2nd-layer Si, respectively. On the other hand, the C-1s core level spectrum has only single Gaussian component with a binding energy of 283.6\pm 0.3 eV. The observed valence band spectra are semiconductor-like and include surface state levels with slightly dispersive structures.

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