Atomic and Electronic Structures of 6H-SiC($11\bar{2}0$) Surface

Yasushi Hoshino, Shingo Matsumoto and Yoshiaki Kido*

Abstract

The atomic and electronic structures of the non-polar 6H-SiC($11\bar{2}0$) 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 = 1.49×10^{15} 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±0.02 Å and in contrast the inter-planar distance between the 2nd- and 3rd-layer C-planes is contracted by 0.021±0.02 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±0.1, 99.5±0.1, 100.3±0.1, and 101.2±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 one single Gaussian component with a binding energy of 283.6±0.3 eV. The observed valence band spectra are semiconductor-like and include surface state levels with slightly dispersive structures.

Department of Physics, Ritsumeikan University, Kusatsu, Shiga-ken 525-8577, Japan

* e-m: ykido@se.ritsumei.ac.jp, Tel: +81-77-561-2710, Fax: +81-77-561-2657