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Surface stress in nano-structural formation

It is clear that surface stress and surface morphology have a strong relationship. The surface stress results from the microscopic bonding configuration at the surface. The Si reconstructed surface has unique structure based on dangling bonds reduction and adatom formation. Although the rearrangement of the surface atoms largely reduces the electronic energy of surface by reducing the number of surface dangling bonds, the surface reconstruction increases the surface stress and the surface energy as well. Complex arrangements of the surface atoms, such as adatoms, dimers, and stacking faults are formed on Si(111) 7×7, and pair of pentagons are formed on Si(110) 16×2. Despite the importance of the surface energy of Si, the experimental knowledge on the impacts of reconstruction on the Si surface has been quite limited. We have focused on stress measurements during desorption and adsorption process of hydrogen on the Si(111) 7×7 and Si(110) 16×2 surfaces. In order to obtain information on both the surface stress and the surface structure simultaneously, we have combined the surface-curvature and the reflection high-energy electron-diffraction instrumentations in an identical ultrahigh vacuum system.

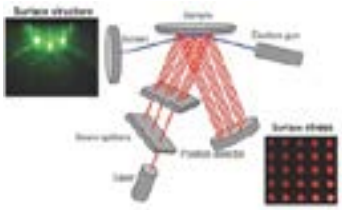

Fig. 1 Schematic setup of combined surface-curvature and RHEED instrumentations

Biography

Currently Hidehito Asaoka focuses on impacts of surface stress on reconstruction and nano-structural formation using molecular beam epitaxy (MBE), X-ray photoelectron sectroscopy (XPS), scanning tunneling microscopy (STM).

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