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### **1. Highlights**

( 1 ) Strain effect on the surface states dispersion on atomically flat, ultra-thin Ag(111) films

We investigated the effect of the misfit strain on the surface electronics state dispersion at atomically flat Ag(111) films heteroepitaxially grown on Si(111) substrates. STM-imaged dI/dV images revealed that the surface electrons have a two-dimensional free-electron like dispersion. However, the bottom of the dispersion was found to shift with the misfit strain accumulated in the Ag films. Furthermore, the surface state shifted locally around the threading dislocations where the misfit strain is locally relaxed.

( 2 ) Hydrogen adsorption at epitaxially grown graphene on the SiC substrates

Mono- and bi-layer graphene are successfully grown on the SiC(0001) surfaces by thermal treatment in an ultra-high vacuum chamber. A recent paper reported that the relativistic electronic state of the graphene is strongly modulated by adsorption of hydrogen. We investigated the hydrogen adsorption site on the epitaxial graphene using LEED, AES, TPD, and STM. Hydrogen atoms were found to adsorb initially on the Si atom. However, the adsorption site is changed from Si to C-atoms in the graphene network in the latter stages of the epitaxial growth.

### **2. List of Publications**

Original Paper

- 1) K. Sawa, Y. Aoki, and H. Hirayama  
Dislocation-induced Local Modulation of the Surface States of Ag(111) Thin Films on Si(111)7x7 Substrates  
Physical Review Letters 104, pp.016806(1)-(4) (2010)
- 2) Y. Aoki, L. Shi, T. Sugimoto, and H. Hirayama  
H adsorption at Ag/Si interfaces in epitaxially grown Ag(111) films on Si(111)7x7 Substrates  
Surface Science 604, pp.420-423 (2010)
- 3) K. Sawa, Y. Aoki, and H. Hirayama

Thickness Dependence of Shockley-type Surface States of Ag(111) Ultra-thin Films on Si(111)7x7 substrates

Physical Review B 80, pp.035428(1)-(5) (2009)

- 4) Y. Aoki, and H. Hirayama  
Hydrogen desorption from 6H-SiC(0001) surfaces during Graphitization  
Applied Physics Letters 95, 094103(1)-(3) (2009)
- 5) H. Hirayama  
Growth of atomically flat ultra-thin Ag films on Si surfaces  
Surface Science 603, pp.1492-1497(2009)
- 6) S. Minamoto & H. Hirayama  
Scattering Potential Evaluation with S+P+D Wave Expansion of a Vacancy Complex on a Si(111) $\sqrt{3}\times\sqrt{3}$ -Ag Surface  
Materials Science & Engineering B 161, pp.16-19 (2009)

### 3. Books

- 1) T. Tsurumi, H. Hirayama, M. Vach, and T. Taniyama  
Nanoscale Physics for Materials Science  
CRS Press (Taylor & Francis) ISBN: 9781439800591

### 4. International/Domestic Conference

- 1) Aoki, and H. Hirayama ; "Hydrogen adsorption at surfaces of the epitaxial grapheme on the 6H-SiC(0001)",  
The 56th International Symposium of American Vacuum, Society (AVS 56), San Jose, U.S.A., Nov.8-13, 2009
- 2) Y. Aoki, T. Sugimoto, L. Shi, and H. Hirayama ; "Hydrogen desorption from ultra-thin Ag films on Si(111) substrates"  
The 10th International Conference on Atomically Controlled Surfaces, Interfaces, and Nanopstructures (ACSIN-10), Granada, Spain, Sept.21-25, 2009
- 3) K. Sawa, Y. Aoki, and H. Hirayama ; "A STM/STS study of Shockley-type surface states at Ag(111) ultra-thin films on Si(111)7x7 substrates"  
The 26th European Conference on Surface Science (ECOSS26), Palma, Italy, Aug.30-Sept.4, 2009
- 4) Y. Toda, Y. Kubota, M. Hirano, H. Hirayama, and H. Hosono ; "STM study of inorganic electride C<sub>12</sub>A<sub>7</sub>e-STAC<sub>3</sub>", Yokohama, June 16-18, 2009
- 5) H. Hirayama; "Nanostructures and their electronic states at surfaces"  
New Zealand-Tokyo Institute of Technology Seminar on Nanotechnology, Ohokayama, January 30, 2009