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1. Main Research Results

- 1) New surface reconstruction at the Bi/Ag(111) surface with a giant Rashba-induced spin splitted bands

We investigated a new surface structure at the Bi/Ag(111) surface system with a large spin-splitting for the two-dimensional surface states. In our STM study on the Bi-induced reconstruction, we found that the Bi/Ag(111) system reveals a striped surface structure at high Bi coverages. In a detailed analysis, the atomic arrangement of the new structure was successfully identified as the (3012) surface reconstruction.

- 2) Hydrogen adsorption at ultra-thin Ag epitaxial film/Si(111) substrate system

Hydrogen adsorption was studied on ultra-thin Ag epitaxial films on Si(111) substrates. On the contrary to the common sense in surface science, we found that hydrogen adsorbs not at the surface of the Ag films, but penetrates the ultra-thin Ag films freely and adsorbs at the Ag/Si interface. The characteristic diffusion constant in the Ag films and the adsorption kinetics at the interface were numerically deduced.

2. List of Publications

Original Paper

- 1) Y. Toda, Y. Kubota, M. Hirano, H. Hirayama and H. Hosono
[Ca₂₄Al₂₈O₆₄]⁴⁺(e⁻)₄ Electride Surface: Preparation and Atomic-Scale Characterization by Scanning Tunneling Microscopy
ACS Nano 5, pp.1907-1914 (2011)
- 2) C. Kato, Y. Aoki, and H. Hirayama
Scanning Tunneling Microscope of Bi-induced Ag(111) Surface Structures
Physical Review B, 82, pp.165407-1-7 (2010)
- 3) 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)

Books

- 1) H. Hirayama, "Surface Science for Semiconductor Engineering"
in Modern Surface Science vol.5 chap.3.1, Kyoritu-syuppan (in press)

3. International Conferences

- 1) Y. Toda, H.Hirayama, and M.Hirano, and H.Hosono;
"Surface of stable electride [Ca₂₄Al₂₈O₆₄]⁴⁺(e⁻)₄"
International Workshop on Novel Superconductors and Super Materials 2011,
Tokyo, Japan, March 6-8, 2011.
- 2) Y. Toda, H.Hirayama, and H.Hosono;
"Surface of Nano-porous crystal C12A7 Electride"
The 9th Japan-France Workshop on Nanomaterials,
Toulouse, France, Nov.24-26, 2010.
- 3) H. Hirayama;
"Surface structure and electronic states of ultra-thin Ag(111) films on Si(111)7x7
substrates"
The 9th Russia-Japan Seminar on Semiconductor Surfaces , Vladivostok, Russia,
Sep. 26-30, 2010.
- 4) L. Shi, Y. Aoki and H. Hirayama;
"Hydrogen transmission in ultra-thin Ag films epitaxially grown on Si(111)
substrates",
18 th International Vacuum Congress, Beijing, China, Aug. 23-27, 2010.
- 5) Y. Aoki, and H. Hirayama;
"H Thermal desorption at Ag/Si(111) $\sqrt{3}\times\sqrt{3}$ R30°-B surface",
18 th International Vacuum Congress, Beijing, China, Aug. 23-27, 2010.