[S-12]

Electronic structures of Gd overlayers and Gd-silicide nanowires on Si(100)

김유권, 이은영, 염한웅
연세대학교 물리학과, 원자선 원자막 연구단

Angle-resolved ultraviolet photoemission spectroscopy (ARUPS) and low-energy electron diffraction (LEED) are employed to investigate Gd-induced reconstructions and Gd-silicide nanowires on Si(100) at the substrate temperatures of RT - 600 ℃. LEED observations indicate that a submonolayer of Gd can induce a 1×4 phase at about 200 ℃, in addition to an apparent 2×7 phase[1] at 300 - 600 ℃. At around 600 ℃, there are streaks along ×1 directions in LEED, which may be related to the formation of Gd-silicide nanowires. ARUPS observations indicate a surface state at the very near E_f and a weak metallic character for the 1×4 phase. For the 2×7 phase, two filled surface states at 0.3 and 0.8 eV(*S1* and *S2*) are observed and are explained from the recent structure model, which consists of two alternating Gd chains with $3a_{Si}$ and $4a_{Si}$ in width, respectively. At around 600 ℃, additional features at 0.1 and 1.1 eV (*S1′* and *S2′*) are found to grow in intensity with increasing Gd coverages. It suggests that *S1′* and *S2′* are related to the Gd-silicide nanowires on the Si surface. Our observations of surface states very close to E_f are consistent with the recent STM observations of the metallic Gd-silicide nanowires on Si(100).[2]

[참고문헌]

(1) B.Z. Liu and J. Nogami, Surf. Sci. **540**, 136 (2003).

(2) D. Lee and S. Kim, Appl. Phys. Lett. **82**, 2619 (2003).