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 °C. LEED observations indicate that a submonolayer of Gd can induce a 1×4 phase at about 200 °C, in addition to an apparent 2×7 phase\(^{(1)}\) at 300 – 600 °C. At around 600 °C, 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 \(E_r\) 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 3artists and 4artists in width, respectively. At around 600 °C, 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 \(E_r\) are consistent with the recent STM observations of the metallic Gd-silicide nanowires on Si(100).\(^{(2)}\)

[참고문헌]