

## Electronic Excitations in ultrathin Ag films on Si(001) surface.

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Electronic excitations in (2x3) Ag/Si(001) and (2x1) Ag/Si(001) were studied by high resolution electron energy loss spectroscopy(HREELS). For (2x3) Ag film, extended tail near the foot of the elastic peak was developed and attributed to intraband electron hole pair excitation in valence band. The loss feature suggests that (2x3) Ag/Si(001) system is metallic. Two surface plasmons associated with the two interfaces, vacuum to Ag film and Ag film to Si, could not be identified although they were reported for Ag/Si(111) system<sup>(1)</sup> with energies around ~4 eV and ~1.3 eV, respectively. The vacuum-Ag interface plasmon (high energy plasmon) is thought to have short life time as evidenced by the strong interband transition starting around 2eV and should be included as a broad structureless feature. Near the energy range where the Ag-Si interface plasmon is expected to develop, we observed two peaks, which can be surface plasmons and also excitations involving surface states. The information on electronic structure still lacks, so the two peaks cannot be identified yet. With Ag deposited on the Si substrate at room temperature, (2x1) LEED pattern was retained with Ag thickness amounting to 4 angstrom although its quality was poor as judged by the LEED intensity, spot size and background intensity. For this system, we found no metallic tail and only broad feature at around 1.35 eV, suggesting semi-conducting surface. As Ag film got thicker, the center of the loss feature shifted to lower energy, 0.7eV, which reminds the features of clean Si(001) surface and suggests the unwetting transition of Ag film.<sup>(2)</sup>

### [참고문헌]

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