

The origin of the intraband plasmons on Au/Si(5512) surface

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We have investigated the electronic excitations for several Au-induced facet structures formed on the Si(5512) surface using high-resolution electron-energy-loss spectroscopy (HREELS). We find a characteristic loss peak from each of the three metallic surfaces, the (337)x2, the (5511), and the Au/Si(557). These loss peaks are identified as one-dimensional (1D) intraband plasmons and their energy-momentum dispersions appear to be quite similar, and are well described by the RPA theory when the Rashba spin-orbit interaction is included. This strongly suggests that they stem from the same origin of the Au-Si band split by the spin-orbit interaction rather than from the band associated with step-edge atomic chains. In addition, we find a weakly dispersing loss peak from the semiconducting (225) facets, which is attributed to an interband transition.

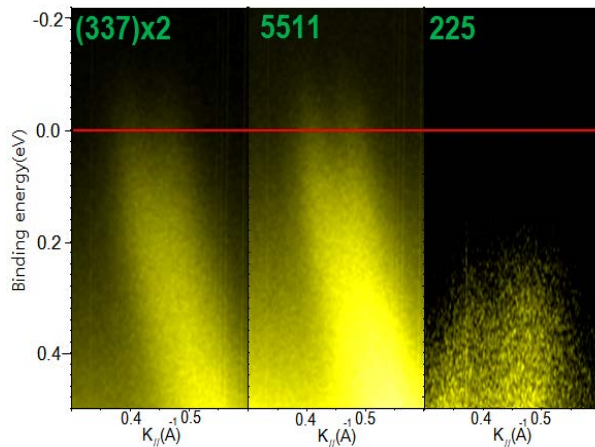


Fig. 1. Au-Si band split of the (337)x2, (5511) facets and non-metallic nature of the (225) facets.

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