Behavior of CaF$_2$ at the Initial Adsorption Stage on Si(114)

Otgobayar Dugerjav, Ganbat Duvjir, Huiting Li, 김희동, 서재명
전북대학교 물리학과 및 광전자정보기술연구소

From the combined studies of STM and synchrotron photoemission, it has been found that a CaF$_2$ molecule is dissociated to Ca and F atoms on the Si(114)-2×1 held at 500°C at the initial adsorption stage. The Ca atoms form isolated and unique shapes of silicide molecules as shown in Fig. (a), while the F atoms are desorbed from the surface. On the other hand, beyond a CaF$_2$ coverage of 0.3 monolayer, as shown in Fig. (b), in addition to these silicide molecules, a 1-D facet [composed of (113) and (115) faces] adjacent to an etch pit has been observed, and F atoms are also detected from photoemission. These results imply that F atoms act as an etchant on Si(114) and CaF is adsorbed selectively on the (113) face of this facet. From the present studies, it has been concluded that, an insulating CaF$_2$ layer like that on Si(111) cannot be formed on Si(114), but a CaF-decorated nanofacet with a high aspect-ratio can be grown.

Keywords: Si(114), CaF$_2$, CaF, Calcium silicide