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Behavior of CaF₂ at the Initial Adsorption Stage on Si(114)

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From the combined studies of STM and synchrotron photoemission, it has been found that a CaF₂ 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 CaF₂ 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 CaF₂ 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), CaF₂, CaF, Calcium silicide

