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Interface formation between MgF_2 and $\text{Si}(111)$ studied by LEED, AES, and TPD

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The phases and interface formation of MgF_2 on $\text{Si}(111)$ were studied by using LEED, AES, and TPD. When thick MgF_2 film was deposited on the $\text{Si}(111)$ surface at RT and annealed at higher temperatures, a sequence of LEED patterns (no LEED pattern $\rightarrow 1\times 1 \rightarrow 3\times 1 \rightarrow 7\times 7$) was observed. On the 1×1 structure, both Mg and F bond to Si and the Mg:F ratio is almost equal to one. Upon annealing this surface at $600\sim 800^\circ\text{C}$, a 3×1 reconstruction is obtained with liberating Mg and SiF_2 . The 1×1 model in which Mg adsorbs on T_4 site and F on H_3 site could explain the simultaneous desorption of SiF_2 and Mg.

When thin MgF_2 film was deposited, an initial α - 1×1 phase transforms to 3×3 and β - 1×1 by thermal annealing with a slow evaporation of F and diffusion of Mg into the surface. the 3×3 surface changes to γ - 1×1 by the selective desorption of F under e-beam irradiation and subsequently to a Mg-induced $\sqrt{3}$ structure by annealing at 600°C .