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Surface x-ray scattering study of a thallium-induced Si(111)-1×1 surface

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We report the atomic arrangement of a thallium (Tl)-induced 1x1 phase on Si(111) surface determined by utilizing synchrotron x-ray scattering. The adsorption of Tl on the Si(111)-7×7 surface has attracted attention due to its peculiar behavior of the "inert pair effect" distinctly different from that of other group III elements such as Al, Ga, and In. Early studies thus claimed that Tl atoms occupied T1 sites directly on top of the unreconstructed Si layer (a 1×1 phase at 1.0 monolayer) due to the monovalent character of Tl.⁽¹⁾ This feature is in sharp contrast with the trivalent nature found in the $\sqrt{3}\times\sqrt{3}$ phase observed commonly to all other group III elements. However, this has been challenged by observing a stable $\sqrt{3}\times\sqrt{3}$ phase and by finding a T4 site as the most stable binding site.⁽²⁾ The T4 sites for Tl have been further confirmed by LEED I(V) analysis.⁽³⁾ From analysis of the crystal truncation rods, we also confirm that Tl occupy the T4 binding sites as proposed in previous study and the bondlength of Tl-Si agrees quite well within 4%.

[참고문헌]

1. L. Vitali et al., J. Vac. Sci. Technol. A 17, 1676 (1999).
2. S. S. Lee et al., Phys. Rev. B 66, 233312 (2002).
3. T. Noda et al., Jpn. J. Appl. Phys. 42, L319 (2003).