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The intermediates of Thermal Decomposition of 1,3-Disilabutane to Silicon Carbide on Si(100) Surface

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1,3-Disilabutane (1,3-DSB) is an excellent precursor for SiC film growth by CVD, but, the decomposition mechanism is not clear. In this study, 1,3-DSB was exposed on Si(100) surface under 100 K in the UHV chamber and thermally decomposed up to 1300 K.and desorbed species detected by Reactive IonScattering (RIS), Auger Electron Spectroscopy (AES), Temperature Programmed Desorption (TPD), and Temperature Programmed RIS (TPRIS) during thermal decomposition.RIS method, physisorbed 1,3-DSB was detected under 100 K.the surface temperature increased, physisorbed 1,3-DSB desorbed molecularly at 114 K and 126K in the TPD. This TPD result was caused by multi-layered 1,3-DSB. Multi-layered 1,3-DSB desorbed at lower temperature than first layered 1,3-DSB. TPRIS results showed that 1,3-DSB partially decomposed to C2SiH4and disappeared over 125 K on the surface. This intermediate more decomposed to the second intermediate, CSiH4, over 180 K and it existed on the surface in the temperature range of 180 K to 900 K in the TPRIS experiments. TPD and AES results showed that CSiH4 lost hydrogen and became SiC above 900K. The adsorption geometries and relative energies of the intermediates, C2SiH4 and CSiH4, were calculated by DFT method.