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PES study of 2-silyl-1,3-disilacyclopent-4-ene adsorption on the Si(001)2x1 surface

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The chemisorption of 2-silyl-1,3-disilacyclopent-4-ene (SDC) on the Si(001)2x1 surface is studied using low energy electron diffraction (LEED), Si 2p and C 1s core level photoemission spectroscopy, and ultraviolet photoemission spectroscopy. The SDC was originally synthesized as a single precursor for the growth of SiC thin film. After the 10 L SDC exposure, the dangling bond surface state in the valence band is completely absent by chemisorption due to the [2+2] cycloaddition reaction between the C=C double bond of the SDC molecule and the Si dimer. Alternate Si and C layer until fifth layer is formed by arrangement of SDC molecule on Si dimer. The curve fitting results of Si 2p core level spectra consistently represent four surface-related components contributed by first, third, and fifth Si layers and the backbonded Si layer. The origins of two C 1s components are also well explained by the [2+2] cycloaddition reaction process.