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Adsorption and thermal reaction of NH₃ on the Si(100) surface

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The initial adsorption of NH₃ on the Si(100) surface makes dissociation products of NH₂ and H bonded to Si dimers at room temperature. However, further reaction and dissociation pathway at elevated temperature have not been clear yet. The reaction products and chemical bonding configuration at different substrate temperatures are investigated by high-resolution photoemission spectroscopy (HRPES) using PAL synchrotron radiation. By the analysis of N 1s core levels, we identified a series of Si₂-NH and Si₃-N species which are come from the successive N-H bond dissociation. These results are consistent with recent theoretical calculations. Higher-temperature annealing makes silicon nitride formation through N incorporation into the Si subsurface.