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Real-Time Investigation of Adsorption Processes : Pyridine on Ge(100)

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The adsorption structures of pyridine (C₅H₅N) on the Ge(100) surface depending on coverage and substrate temperature have been studied in detail by scanning tunneling microscopy (STM). Initially pyridine molecules reside on cave site of c(4x2) reconstructed domains of clean Ge(100) surface. The site indicates the space between two neighboring Ge atoms which are electron deficient in buckled Ge-Ge dimers. Pyridine molecules lie down in this site by weak π interaction with electron deficient Ge atoms. Up to 0.25 ML, pyridine molecules are absorbed on this sites and c(4x2) reconstruction is followed on all surface areas. Above 0.25 ML, pyridine molecules begin to diffuse into electron deficient Ge atoms of dimers from cave sites. In this coverage, pyridine molecules stand up by repulsive interaction between each molecules. The feature of this configuration is expected more unstable than lying down molecules. At 0.33 ML, alternative lines of the lying down and standing up structures of pyridine molecules are observed. The c(4x2) substrate structure is also converted to p(2x2) structure induced by adsorbed pyridine molecules. The relationship between adsorption of pyridine molecules and change of substrate structure will be discussed by STM images.