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Adsorption and Reaction of Acetylene on Ge(100)-2×1

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The adsorption and thermal desorption of acetylene on Ge(100) have been studied in ultrahigh vacuum (UHV) by Auger electron spectroscopy (AES), temperature programmed desorption (TPD), and scanning tunneling microscopy (STM). Acetylene is found to chemisorb and to desorb molecularly on Ge(100) via a mobile precursor in a different way with Si(100). TPD measurements show two molecular desorption features near 520 K (α) and 570 K (β) indicating the possibility of more than two molecular adsorption geometries. Initial adsorption geometries are characterized by STM at room temperature and two distinctive features (configuration I and III) are also observed in the STM images. In configuration I, acetylene molecules adsorb in di-σ form parallel to a single Ge-Ge dimer. Configruation III involves tetra-σ form parallel to the dimer axis with a major probability. With STM images obtained after annealing acetylene chemisorbed Ge(100) surface at different temperatures, it is found that configuration I and III indicate α state and β state in TPD spectra respectively. Based on these results, we will present the adsorption geometry and thermal behavior of acetylene on Ge(100)-2x1.