135c Adatom-Pair Chain Structures: Metastable Precursors to Island Formation on the Ge-Si(100) 2xn Alloyed Surface

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We have identified that adatom pairs are the main transport adspecies on the 2xN SiGe wetting layer, using polarity-dependent scanning tunneling microscopy. These adatom pairs form chevron-like, conjugated chains on the SiGe alloy surface, ranging in length from 1 to approximately 10 units of adatom pairs. The adatom-pair chains exhibit kinked and straight segments. We measure a kink-to-straight ratio of 2:1, surpassing the 1:1 ratio predicted from random chain configurations. Substrate-mediated-strain interactions are likely to render the kinked segments energetically favorable. These adatom-pair chains convert to compact islands at elevated temperatures, suggesting that they are the main precursor to island formation on the SiGe wetting layer. We use a pattern-recognition algorithm to distinguish adatom pairs from compact islands in dual-polarity images, and measure the conversion rate from 90 to 150 □C to extract the activation barrier of approximately 0.8 eV. The authors acknowledge support from NSF CAREER (DMR-0094145) and ARO (W911NF-05-1-0012). Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000.