Stability of step-edge decorated atom wires

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The formation of atomic wires via pseudomorphic step-edge decoration has been analyzed for Ga on the Si(112) surface using Scanning Tunneling Microscopy and Density Functional Theory. Our results prove that the Si(112)6 × 1-Ga surface contains zig-zag Ga chains formed by a step-edge Ga-row and a terrace Ga-row. Our results suggest that step-edge decorated atom wires cannot be stabilized under molecular beam epitaxy growth conditions; on the contrary, the fabrication of nanowire structures on stepped semiconductor surfaces seems to be hampered by the passivation of dangling bonds on the substrate's terraces. Although the Si(112)6 × 1-Ga system appears to be quasi two-dimensional, the Ga overlayer presents a quasi one-dimensional surface state.

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