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Structure of the modulation hole doped ($2\sqrt{3}$x$2\sqrt{3}$)R30° Sn double layer on Si(111)[1] PAUL C. SNIJDERS, Oak Ridge National Lab, YING-TZU HUANG, University of Pennsylvania, State College, FANGFEI MING, DANIEL MULUGETA, WEISONG TU, University of Tennessee, Knoxville, PAUL R.C. KENT, Oak Ridge National Lab, RENEE D. DIEHL, University of Pennsylvania, State College, HANNO H. WEITERING, University of Tennessee, Knoxville — Over the years, a large collection of temperature dependent phase transitions has been identified in atomically thin metal overlayers on semiconductor surfaces. However, studying their doping dependence remains difficult due to the symmetry breaking nature of dopant atoms located on top of these structures, and the associated local lattice deformations localizing the doped carriers. Here we have used a subsurface modulation doping approach using B on Si(111) to hole-dope an overlaying Sn double layer. STM, LEED-I(E), and XPS were used to characterize the structure of a ($2\sqrt{3}$x$2\sqrt{3}$)R30 Sn double layer on a Si(111) ($\sqrt{3}$x$\sqrt{3}$)-B surface. STM images 4 atoms in the top Sn layer. Using the tip to remove this top layer, a second layer consisting of 3 triangular structures becomes visible, resulting in a total of 13 Sn atoms per unit cell, consistent with an XPS core level intensity analysis. An extensive LEED-I(E) analysis using 20 independent beams with an energy range of 7126 eV points to a structural model consistent with the STM and XPS data and having a Pendry R-factor of 0.34.

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