

Abstract Submitted
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The Pb/Si(111) phase diagram and the thermal stability of a “Devil’s Staircase” S. STEPANOVSKYY, M. HUPALO, M. YAKES, V. YEH, M. TRINGIDES, Iowa State University, Ames Laboratory of US DOE, Ames, IA 50011 — The T - θ phase diagram for Pb/Si(111) was determined in the range $6/5 < \theta < 4/3$ ML from complementary STM and SPA-LEED experiments. Within this coverage a “Devil’s Staircase” (DS) was found with numerous phases formed as a result of the long range elastic Pb interactions. The presence of the DS phases can account for previous contradictory observations in the literature about the Pb/Si(111) phases. In addition we study the thermal stability of the different linear DS phases and determine that the transition temperature is a monotonic function of the phase periodicity. Because of additional complexity in the experimental system (i.e. 2-dimensionality and 3-fold symmetry) the DS phases transform at higher temperature into commensurate phases of 3-fold symmetry “HIC”. Different types of “HIC” phases have been discovered differing in the size of their supercell within ~ 0.04 ML coverage variation. The presence of such large number of different ordered phases within a very small range of control parameters demonstrate the unusual degree of self organization in Pb/Si(111).

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