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Intrinsic Character of the 3x3 to R3xR3 Phase Transition in Pb/Si(111): True variable Temperature STM Experiments IVAN BRIHUEGA, OSCAR CUSTANCE, RUBEN PEREZ, Dept. de Fsica Teorica de la Materia Condensada, C-III, Universidad Autnoma de Madrid, E-28049- Madrid, Spain, JOSE MARIA GOMEZ-RODRIGUEZ, Dept. de Fsica de la Materia Condensada, C-III, Universidad Autnoma de Madrid, E-28049- Madrid, Spain — We have studied the (3x3) to (root 3 x root 3) reversible phase transition in Pb/Si(111) by means of variable temperature scanning tunneling microscopy and density functional first-principles calculations. This phase transition consists on a lowering of the symmetry of the system produced by a change of the surface periodicity that evolves from a (root 3 x root 3) at room temperature to a (3x3) at low temperature. We have been able to prepare extremely large domains completely free of defects. These large free of defects regions, together with our ability to track the same area with atomic resolution in a temperature range between 40 K and 200 K have allowed us to detect the intrinsic character of the phase transition at temperatures around 86 K. This intrinsic character is in full agreement with our first-principles calculations. Moreover, our results show that the hypothesis that point defects play a fundamental role as the driving force, reported for similar systems, can be discarded for Pb/Si(111).

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