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Crystalline Structure of the Pb/Si(111)7x7 Stable Wetting Layer M. GRAMLICH, S.T. HAYDEN, YIYAO CHEN, U. Missouri, C. KIM, Kyun Hess U., Korea, M.C. TRINGIDES, Ames Lab-USDOE, P.F. MICELI, U. Missouri — The wetting layer formation in the Pb/Si(111)7x7 system has attracted extensive interest because of anomalously fast kinetics, which enables the formation of quantum size effect (QSE) nanoislands [Jeffrey et al. PRL **96**, 106105 (2006)]. However, previous studies of the wetting layer by x-ray diffraction and scanning-probes have led to *inconsistent* structural models; thus, the structure of this wetting layer has been unsolved. Furthermore, a recent investigation has revealed that the wetting layer is out-of-equilibrium over a surprisingly broad temperature range [Gramlich et al., PRB **84**, 075433 (2011)]. Using *in situ* x-ray scattering methods, we have solved the *stable*, low temperature annealed structure of the wetting layer. It exhibits a strained atomic layer where Pb atoms are in transition, from Si-7x7 sites towards 8x8-sites, with some Pb-atoms vertically closer to the Si-7x7. Interestingly, the Si adatoms shift to the edges of the unit cell. Funding is acknowledged from NSF DMR-0706278 (PFM, MWG, STH, YC, and the Ministry of Knowledge Economy of Korea 2009-F014-01 (CK). The experiments were performed on the 6IDC beam line, supported by the US-DOE (through Ames Lab, W-7405-Eng-82), at the Advanced Photon Source (US-DOE, W-31-109-Eng-38) located at Argonne National Laboratory.

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