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Super-diffusive Motion of the Pb Wetting Layer on the Si(111) Surface M.S. ALTMAN, K.L. MAN, M.M.T. LOY, Hong Kong University of Science and Technology, M.C. TRINGIDES, Iowa State University — An unusual mass tansport behavior has been observed in the dense Pb wetting layer on the Si(111) surface. Mass transport is studied by observing non-equilibrium coverage profile evolution with low energy electron microscopy and micro-low energy electron diffraction (m-LEED). The strong sensitivity of diffraction features to Pb coverage in this system allows the Pb coverage profile to be determined precisely with high spatial resolution using m-LEED. Equilibration of an initial coverage step profile produced by laser induced thermal desorption proceeds by the exchange of mass between two steep coverage gradients that travel in opposite directions with invariant shapes. The coverage profile between these two moving edges unexpectedly exhibits a concave shape that apparently contradicts local mass conservation given by the continuity equation. The equilibration time is independent of Pb coverage above a critical coverage, 1.24 ML, but diverges sharply below. The observed spatio-temporal characteristics and lower cutoff for fast dynamics may signal a very unusual coverage dependence of diffusion or might suggest an exceptional collective super-diffusive mechanism by which diffusion is not driven by the local coverage gradient in the usual way.

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