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Quantum Size Effect on Adatom Surface Diffusion JINFENG JIA, Department of Physics, Tsinghua University, Beijing 100084, China, LIYING MA, LIN TANG, XUCUN MA, Institute of Physics, Chinese Academy of Sciences, Beijing 100080, China, QIKUN XUE, Department of Physics, Tsinghua University, Beijing 100084, China; Institute of Physics, Chinese Academy of Sciences,Beijing 100080, China, Y. HAN, STEVE HUANG, FENG LIU, Department of Material Science and Engineering, University of Utah, Salt Lake City, Utah 84112 — Using scanning tunnelling microscopy, we demonstrate the nucleation density of Fe islands on surface of nanoscale Pb films oscillates with film thickness, providing a direct manifestation of quantum size effect on surface diffusion. The Fe adatom diffusion barriers were derived to be 204 and 187 meV on a 21 and 26 monolayer (ML) Pb film, respectively, by matching the kinetic Monte Carlo simulations to the experimental island densities. The effect is further illustrated by growth on wedged Pb films, where the Fe island density is consistently higher on the odd-layer films than on the even-layer films in the thickness range of 11 to 15 ML.

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