Abstract Submitted for the MAR09 Meeting of The American Physical Society

Pseudogap Mediated by Quantum-Size Effects in Lead Islands KEDONG WANG, XIEQIU ZHANG, Chinese University of Hong Kong, M.M.T. LOY, Hong Kong University of Science and Technology, T.-C. CHIANG, University of Illinois at Urbana-Champaign, XUDONG XIAO, Chinese University of Hong Kong — Quantum confinement effects in both metallic and semiconducting materials are subjects of intense prevailing interest. For thin films and islands of Pb grown on semiconductor surface, quantum well states have been clearly identified and their consequences in growth, thermal stability, and superconductivity have been well studied. In this talk, we will present scanning tunneling spectroscopy measurement results of Pb islands on Si(111) at high energy resolution that reveal a novel pseudogap, or a pseudopeak in special cases, around the Fermi level in addition to the usual quantum well states. These gap or peak features persist to temperatures as high as ~80 K and are uniquely related to the quantum well nanostructure of the Pb islands. A systematic analysis indicates that electron-phonon scattering is responsible for the observed electronic structure. The behavior of the pseudogap has a strong resemblance to that of the pseudogap in high temperature superconductors and certain connections may be speculated.

Xudong Xiao Chinese University of Hong Kong

Date submitted: 30 Nov 2008 Electronic form version 1.4