Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Superconductivity of Ultra-thin Pb films on Semiconductor Substrates: A Scanning Tunneling Microscopy/Spectroscopy Study[1]
SHENGYONG QIN, JUNGDAE KIM, ALEXANDER AKO KHAJETOORIANS, CHIH-KANG SHIH, University of Texas at Austin — Ultra-thin Pb films on semiconductor substrates have exhibited many intriguing phenomena manifested by the quantum confinement of electronic states. Quantum stability has been a topic of interest for many years. Recently, it was shown that quantum confinements also play an interesting role on superconductivity. Oscillations of superconductivity gap and Tc as a function of film thickness have been observed in Pb/Si(111) and Pb/Ge(111) systems. Moreover, it is found that the superconductivity remains very robust even for films as thin as 5 ML. An interesting question arises as to what extent the robustness of superconductivity remains in even thinner regime. By using a different surface template, namely $\sqrt{3}$x$\sqrt{3}$-α Pb/Si(111) surface, we have grown uniform Pb films down to 2 ML. The film shows preferred thicknesses of 2ML and 4ML, presumably a manifestation of the quantum stability. We find that the superconducting gap remains robust down to 4ML and shows BCS-like temperature dependence. For 2ML films, we find a much smaller gap at 4.2K. Whether or not it corresponds to superconducting gap is under investigation.

[1]NSF-IGERT DGE-0549417 NSF-FRG 26-1126-8750

Shengyong Qin
University of Texas at Austin

Date submitted: 26 Nov 2007 Electronic form version 1.4