

Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Superfluid Onset and 2D phase transitions of Helium-4 on Lithium and Sodium ANGEL VELASCO, FAWN HUISMAN, University of California, Irvine, ELI VAN CLEVE, Lawrence Livermore National Laboratory, PETER TABOREK, University of California, Irvine — We have fabricated lithium and sodium films on quartz crystal microbalances (QCM) using in situ low temperature pulsed laser deposition. The frequency shift and dissipation of the QCM was measured as a function of helium pressure and chemical potential and used to construct the phase diagram of helium films on these substrates. Pressure measurement techniques based on an RGA mass spectrometer, which provides accurate measurement below 10^{-8} Torr will be described. Lithium and sodium are predicted to be intermediate strength substrates which are strong enough to be wetted by He-4 but weak enough that solid-like layers do not form, so they are candidates for observing sub-monolayer superfluidity in direct contact with a metallic surface. Helium adsorption isotherms and quenches between 0.5K and 1.6K on both lithium and sodium indicated continuous, sub-monolayer helium film growth and superfluid onsets in sub-monolayer films. Features below 1K indicate a collision between a classical 2D liquid/vapor phase transition and the Kosterlitz-Thouless superfluid phase transition. We see no evidence for the pre-wetting step instability predicted for helium on sodium.

Angel Velasco
University of California, Irvine

Date submitted: 11 Nov 2011

Electronic form version 1.4