Abstract Submitted
for the PSF09 Meeting of
The American Physical Society

An unusual way to control the surface doping of cuprate superconductors in Angular Resolved Photoemission Spectroscopy (ARPES) experiments. ARI D. PALCZEWSKI, TAKESHI KONDO, A. KAMINSKI, Ames Laboratory and Department of Physics and Astronomy, Iowa State University, Ames, IA 50011, USA, G.Z.J. XU, G. GU, J.S. WEN, Condensed Matter Physics and Materials Science Department, Brookhaven National Laboratory, Upton, New York 11973, USA — We study the variation of the electronic properties at the surface of a high temperature superconductor $Bi_2Sr_2CaCu_2O_{8+\delta}$ (Bi2212) as a function of vacuum conditions in angle resolved photoemission spectroscopy (ARPES) experiments. Normally, under less than ideal vacuum conditions the carrier concentration of (Bi2212) increases with time due to the absorption of oxygen from CO2 and CO molecules that are prime contaminants present in ultra high vacuum (UHV) systems. We find that in a high quality vacuum environment at low temperatures, the surface of Bi2212 is quite stable (the carrier concentration remains constant), however at elevated temperatures the carrier concentration decreases due to the loss of oxygen atoms from the Bi-O layer. These two effects can be used to control the carrier concentration in-situ. Allowing us to probe the doping phase diagram of cuprates on a single sample. Support: Department of Energy DE-AC02-07CH11358 & DE-AC02-98CH10886 and National Science Foundation DMR-0537588

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Date submitted: 12 Oct 2009 Electronic form version 1.4