Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Covalent Bonding and Orbital Reconstruction at an Oxide Interface. JAK CHAKHALIAN, University of Arkansas, JOHN FREELAND, Advanced Photon Source, Argonne National Laboratory, HANS-ULRICH HABERMEIER, GEORG CRISTIANI, G. KHALIULLIN, Max Planck Institute for Solid State Research, MICHEL VAN VEENENDAAL, Northern Illinois University, BERNHARD KEIMER, Max Planck Institute for Solid State Research — Atomically controlled interfaces between two materials can give rise to novel physical phenomena and functionalities. Modern synthesis methods have yielded high-quality heterostructures of oxide materials with competing order parameters. Orbital reconstructions and covalent bonding must be considered as important factors in the rational design of oxide heterostructures. Here we examine the interface between high-temperature superconducting (Y,Ca)Ba2Cu3O7 and metallic La2/3Ca1/3MnO3 by resonant x-ray spectroscopy. The resulting data show that electrons are transferred from Mn to Cu ions across the interface. This phenomenon is accompanied by the major reconstruction of the orbital occupation and symmetry in the CuO2 plane. Specifically, we report the experimental finding that unlike bulk at the interface Cu d3z2-r2 orbital is partially occupied and electronically active. This observation opens a path to orbital engineering of interface-controlled materials. J. Chakhalian et al, "Covalent Bonding and Orbital Reconstruction at an Oxide Interface", Science, v. 318, 1155 (2007).

Jak Chakhalian
University of Arkansas

Date submitted: 26 Nov 2007 Electronic form version 1.4