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Anomalous Expansion of the Cu-Apical O Distance in Superconducting Cuprate Oxide Bilayers HUA ZHOU, National Synchrotron Light Source, Brookhaven National Lab, YIZHAK YACOBY, Racah Institute of Physics, Hebrew University, RONALD PINDAK, National Synchrotron Light Source, Brookhaven National Lab, VLADIMIR BUTKO, GENNADY LOGVENOV, IVAN BOZOVIC, CMPMS Department, Brookhaven National Lab — Interfaces between complex oxides have received considerable attention due to the observation of fascinating quasi two- dimensional phenomena such as a high-mobility electron gas, interfacial ferromagnetism, and, recently, the observation of interfacial high-temperature superconductivity in epitaxially grown bilayers of metallic $La_{1.55}Sr_{0.45}CuO_4$ and insulating La_2CuO_4 on $LaSrAlO_4$ substrates[1]. To help understand the mechanism underlying the observed interfacial superconductivity, we directly measured the 3D electron density of this epitaxial bilayer system with subatomic resolution using the Coherent Bragg Rod Analysis phase retrieval method[2]. The Cu to apical O distance, which is believed to be a critical parameter controlling T_C, was found to expand dramatically from the substrate/film interface towards the surface. The correlation between structural features and interface transport properties will be discussed. [1]A. Gozar et al., Nature, 455, 782(2008). [2]Y. Yacoby et al., Phys. Rev. B, 77, 195426(2008).

Hua Zhou
National Synchrotron Light Source, Brookhaven National Lab

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