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X-ray Structural Studies of $HgBa_2CuO_{4+\delta}$ G. CHABOT-COUTURE, Stanford U., J. N. HANCOCK, SSRL, L. LU, Stanford U., A. BIANCONI, Università di Roma, F. BRIDGES, UC Santa Cruz, Z. ISLAM, APS, ANL, H. OYANAGI, AIST, Y.-C. CHO, SSRL, Y. LI, G. YU, Stanford U., X. ZHAO, SSRL, M. GREVEN, Stanford University — In recent years, there has been mounting evidence for electronic and structural inhomogeneities in the cuprate high-temperature superconductors (HTSC). From stripe phases found in lanthanum-based cuprates to the oxygen-order-driven lattice modulations in $YBa_2Cu_3O_{7-\delta}$ and to the nanoscale electronic density-of-states "patches" in $Bi_2Sr_2CaCu_2O_{8+\delta}$ and other cuprates, these inhomogeneities appear to have significant effects on the electronic, transport, and spectroscopic properties of these systems. Of all the high-T_c materials, $HgBa_2CuO_{4+\delta}$ has the highest transition temperature among single-layer compounds and one of the simplest structures. Consequently, it may be the perfect candidate system to help separate the effects of extrinsic structural inhomogeneities from those that are universal and intrinsic to HTSC. To begin to address this issue, we have grown sizable, high-quality crystals of $HgBa_2CuO_{4+\delta}$ and carried out two structural studies: a diffuse x-ray scattering experiment, showing evidence for short-range structural displacement modulations, and a polarized extended x-ray absorption fine-structure (EXAFS) experiment on the temperature-dependent local structure around the copper and mercury atoms.

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