

Chez Pierre

Presents ...

Friday, February 6, 2009

10:00am

MIT Room 4-331



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“Insights in High-Tc Superconductivity From the Study of Cuprate Heterostructures”

Using a unique molecular beam epitaxy system, we synthesize atomically smooth HTS thin films, multilayers and superlattices.¹ Such heterostructures enable novel experiments that probe the basic physics of HTS. For example, we have established that HTS and anti-ferromagnetic phases separate on Ångstrom scale, while the pseudo-gap state apparently mixes with HTS over an anomalously large length scale (“Giant Proximity Effect”).²

In this talk, I will review our most recent experiments on such films and superlattices, including XRD, AFM, angle-resolved TOF-ISARS, transport measurements, high-resolution TEM, resonant X-ray scattering, low-energy muon spin resonance, ultrafast photo-induced RHEED, COBRA surface crystallography, and ultra-high magnetic field spectroscopy. The results include an unambiguous demonstration of strong coupling of *in-plane* charge excitations to *out-of-plane* lattice vibrations³, a discovery of interface HTS⁴, and evidence that HTS occurs in a single CuO₂ plane.

1I. Bozovic et al., Phys. Rev. Lett. **89**, 107001 (2002); P. Abbamonte et al., Science **297**, 581 (2002).

2I. Bozovic et al., Nature **422**, 873 (2003); Phys. Rev. Lett. **93**, 157002 (2004)

3N. Gedik et al., Science **316**, 425 (2007); Z. Radovic et al., Phys. Rev. B **77**, 092508 (2008)

4A. Gozar et al., Nature **455**, 782 (2008).