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**Electronic inhomogeneities in superconducting $YBa_2Cu_3O_{6+x}$**
FERENC STERCEL, Dept. of Materials Science and Engr., University of Pennsylvania, JAE-HO CHUNG, NIST, TAKESHI EGAMI, Dept. of Physics and Astronomy and Department of Materials Science and Engineering, University of Tennessee-Knoxville, MASATOSHI ARAI, TETSUYA YOKOO, HYUNGJE WOO, Dept. of Physics and Astronomy, University of Tennessee-Knoxville, MOHANA YETHIRAJ, HERB A. MOOK, ORNL, CHRIS D. FROST, Rutherford Appleton Laboratory, UK, FATIH DOGAN, Dept. of Materials Science and Engr., University of Missouri-Rolla — There has been an increasing amount of experimental evidence for the presence of local electronic inhomogeneities in superconducting cuprates. Inelastic pulsed neutron scattering measurements on $YBa_2Cu_3O_{6+x}$single crystals with different oxygen concentrations show that the zone boundary softening of the in-plane LO Cu-O bond stretching mode is the same for all doping levels. In addition, the spectral weight of the softened mode increases with increasing doping. This indicates that there is a microscopic electronic phase separation in superconducting $YBa_2Cu_3O_{6+x}$. Furthermore, triple axis inelastic neutron scattering measurements on the underdoped $YBa_2Cu_3O_{6.6}$ performed at different temperatures revealed that a new local mode appears at 65 meV at higher temperatures (200 K and above). It might indicate the presence of polarons.

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