Abstract Submitted
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Far-Infrared Studies of the Development of the Electronic Lattices in $La_2CuO_{4+0.0315}$ Y.H. KIM, Department of Physics, University of Cincinnati, H.H. HSIEH[1], P.H. HOR, TcSUH, University of Houston — $La_2CuO_{4+0.0315}$ undergoes a superconducting transition with an onset at T_c = 30 K when it is slow-cooled at a rate of 1 K/min from the room temperature but it becomes a T_c = 15 K superconductor when quenched down to 77 K in less than 1 minute. The corresponding far-infrared reflectivity measurements reveal that there exists only one collective mode at $\omega_{G1} \sim 24$ cm^{-1} in the T_c = 15 K phase [1]. However, when slow-cooled, there develop a series of collective modes at $\omega_{G1} \sim 24$ cm^{-1}, $\omega_{G2} \sim 37$ cm^{-1}, $\omega_{G3} \sim 46$ cm^{-1} , and $\omega_{G4} \sim 60$ cm^{-1} with a complex temperature dependences. Upon cooling, ω_{G1} and ω_{G3} show the similar behaviors as the Sr/O co-doped LSCO at the hole concentration p = 0.07 [1] while the ω_{G2} mode loses its oscillator strength for T < 150 K and the ω_{G4} mode shows no change in its strength at all temperatures. We explain the implications of our findings within the 2D electronic lattice model [1, 2].

1. Y. H. Kim and P.H. Hor, Mod. Phys. Lett. B**15**, 497 (2001).

2. P.H. Hor and Y.H. Kim, J. Phys.: Condens. Matter **14**, 10377 (2002).

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