

# In-plane charge dynamics of $\text{La}_{2-x-y}\text{Nd}_y\text{Sr}_x\text{CuO}_4$ and $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$

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Using infrared spectroscopy, we found that changes in the in-plane charge dynamics attributable to static stripe order in  $\text{La}_{1.4-x}\text{Nd}_{0.6}\text{Sr}_x\text{CuO}_4$  or superconductivity in  $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$  ( $x = 0.08$  and  $0.125$ ) are confined to energies smaller than  $200 \text{ cm}^{-1}$ . An absorption peak in the low-frequency conductivity of the Nd-doped compounds is suggestive of localization effects due to disorder. This result is consistent with the reduced dimensionality of the electronic transport in the static stripe ordered state. This peak is absent in the Nd-free compound. Below  $T_c \approx 30 \text{ K}$ , we observed a distinct decrease of conductivity in  $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$  at  $\omega < 200 \text{ cm}^{-1}$ . The energy scale attributable to localization in  $\text{La}_{1.4-x}\text{Nd}_{0.6}\text{Sr}_x\text{CuO}_4$  appears to be comparable to the magnitude of the superconducting gap in  $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$ . This may explain anomalous sensitivity of superconductivity in La-based cuprates to static stripe ordering. Neither superconductivity nor static stripe ordering have noticeable effect on the depression of the scattering rate at  $\omega < 1000 \text{ cm}^{-1}$  reminiscent of the pseudogap state in other classes of moderately doped cuprates. In  $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$  the characteristic temperatures and the energy scales of pseudogap and superconducting gap differ about one order of magnitude.

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