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Charge Order and (001) Order in Superoxygenated Lanthanum Cuprates¹ ZHIWEI ZHANG, Z.-H. ZHU, Univ of Connecticut - Storrs, RONNY SUTARTO, FEIZHOU HE, Canadian Light Source, WILLIAM A. HINES, JOSEPH I. BUDNICK, Univ of Connecticut - Storrs, F.-C. CHOU, National Taiwan University, BARRETT WELLS, Univ of Connecticut - Storrs — Resonant elastic X-ray scattering has become a powerful technique in studying subtle charge, orbital, and nematic ordering in many correlated electron compounds, especially in cuprate superconductors. $(\text{La, Sr})\text{CuO}_{4+\delta}$ is a less-studied but important hole doped superconductor where favored electronic phases spatially segregate in the phase diagram. In particular, one of the more prominent stable phases occurs at 1/8th doping with magnetic stripe scattering which is particularly sharp. Here we report a study in the charge order in this material with and without Sr substitutional doping. Charge ordering is exceedingly difficult to measure in these compounds for reasons that remain unsolved. In a particularly advantageous case we detected a resonant peak at $h = 0.25$ at Cu L_3 edge whose temperature dependence reflects a transition temperature $\sim 50\text{K}$. Further, we observed the nominally disallowed (001) diffraction peak at a resonance energy between the O pre-edge and K edge. This resonant (001) is reminiscent of a nematic order study in other cuprate superconductors, but the detailed energy dependence is quite different. We discuss the implications in light of electronic phase separation. 1. A.J. Achkar et al., Science 351, 6273 (2016)

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