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Superstructural lattice distortion within electron doped superconductor $\mathbf{Pr_{0.88}LaCe_{0.12}CuO_4}$[1] BRANTON J. CAMPBELL, Dept. of Physics and Astronomy, Brigham Young University, STEPHAN ROSENKRANZ, PETER J. CHUPAS, Materials Science Division, Argonne National Laboratory, HYE JUNG KANG, PENGCHENG DAI, Dept. of Physics and Astronomy, University of Tennessee, Knoxville, YASUAKI KURITA, SEIKI KOMIYA, YOICHI ANDO, Central Research Institute of the Electric Power Industry, Japan — It is well-known that electron-doped $Nd_{0.85}Ce_{0.15}CuO_4$ can be reversibly converted between the superconductor and non-superconductor by appropriate high-temperature treatments in reducing or oxidizing environments, respectively. Samples that exhibit superconductivity also present a crystalline Nd_2O_3 (bixbyite structure) impurity phase as well as diffuse (0, 0, L) rods of scattering at superlattice positions in the (H, K, 0) plane that coincide with the reciprocal lattice of the larger $2\sqrt{2} \times 2\sqrt{2}$ impurity cell. We present a diffuse scattering analysis of the rod scattering in related compound $Pr_{0.88}LaCe_{0.12}CuO_4$ (PLCCO) and demonstrate that they are evidence of a superstructural distortion of the CuO_2 sheets, rather than an impurity effect. This in-plane superstructure may prove to be a necessary condition for superconductivity in the electron-doped cuprates.

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