

Local Structural Properties of Checkerboard Phased $\text{Ca}_{1-x}\text{Na}_x\text{CuO}_2\text{Cl}_2$ Superconductors

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We present the temperature-dependent structural properties of $\text{Ca}_{1-x}\text{Na}_x\text{CuO}_2\text{Cl}_2$ (NaCCOC) superconductors with Na composition ratio of $x = 0 - 0.18$ studied using extended x-ray absorption fine structure (EXAFS). The NaCCOC superconductors were fabricated in a high pressure furnace with precursors of $\text{Ca}_2\text{CuO}_2\text{Cl}_2$, NaClO_4 and NaCl . Specimen T_c s were 0, 15, 21 and 27 K. X-ray diffraction measurements revealed that the specimens were single crystals. EXAFS measurements were performed at Cu K-edge in the temperature range of 5 – 100 K. The EXAFS demonstrated that the crystallinity of the NaCCOC crystals was enhanced with the Na composition ratio, and that the Na atoms were mostly replaced in the Ca sites. From the EXAFS measurements we found that the NaCCOC crystals had a tetragonal structure with a space group of $p42/nm$, and that the lattice constants of $a = b \sim 5.3 \text{ \AA}$ and $c \sim 15.1 \text{ \AA}$. No structural transition was observed in the temperature range from all specimens. We will also compare the structural properties of the NaCCOC crystals with those of stripe-phased $\text{La}_{1.6-x}\text{Sr}_x\text{Nd}_{0.4}\text{CuO}_4$ crystals.

Keywords : structure, EXAFS, superconductor, checkerboard phase, NaCCOC