

The Formation of Infinite-layer Cuprates and Correlation with
Temperature and Partial Pressure of Oxygen

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Abstract

Various combinations of calcination temperature and oxygen partial pressures have been investigated to stabilize the infinite-layer structure in $\text{Ca}_{1-x}\text{Sr}_x\text{CuO}_2$ and $(\text{Ca}_{1-x-y}\text{Y}_y)\text{Sr}_x\text{CuO}_2$ systems using a solid-state reaction method. It is found that the stability of infinite-layer structure for different compositions strongly depends on the calcination conditions. The infinite-layer structure is stable in the range of $0.12 \leq x \leq 0.16$ for $\text{Ca}_{1-x}\text{Sr}_x\text{CuO}_2$ at the calcination conditions of 940°C and 3% partial pressure of oxygen, and also in the range of $0.08 \leq x \leq 0.12$ at the calcination conditions of 1020°C and 1 atm of flowing oxygen. The solubility limit extends to the range of $0.10 \leq x \leq 0.20$ for $y = 0.02$ in $\text{Ca}_{1-x-y}\text{Y}_y\text{Sr}_x\text{CuO}_2$ prepared at 940°C under 3% partial pressure of oxygen.