Superconducting properties of Y(Ba1-xCax)2Cu3O7-δ (0 ≤ x ≤ 0.05) system

ABSTRACT

A series of polycrystalline compounds with a nominal composition of Y(Ba1-xCax)2Cu3O7ī ŭ (0⩽x⩽0.05) had been synthesized using solid state reaction method. Crystal structure of those samples was characterized by Rietveld refinement on the x-ray powder diffraction data. It was found that the structural parameters were not changed appreciably with Ca content in Y(Ba1-xCax)2Cu3O7ī ŭ. While c-axis remained almost unchanged, both a and b axes decreased slightly leading to the decrease in orthorhombicity of Y-123 phase. The superconducting transition temperature, Tc was determined by measuring the change of electrical resistance versus temperature (50 Kï 300 K) using a four point probe technique. The Tc was observed to decrease gradually by Ca doping from 91 K for xŦϬ.00 to 88 K for xŦϬ.05 attributable to oxygen vacancy disorder. In addition, the superconducting transition breadth, ϕT, increased with Ca doping because of degraded crystallinity or inhomogeneity of the samples. Finally, scanning electron micrographs indicated grain growth induced by Ca doping.

Keyword: Grain growth; Orthorhombicity; Superconducting transition temperature; YBCO