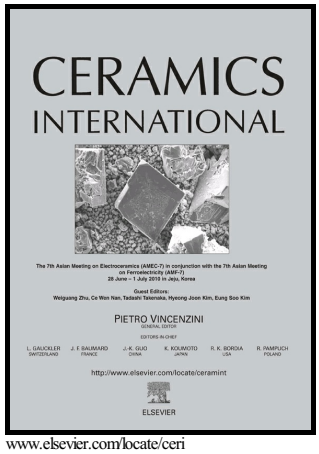

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The influence of heat treatment on the microstructure, flux pinning and magnetic properties of bulk BSCCO samples prepared by sol-gel route

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Abstract

We study the combined influence of calcination and sintering temperature on the microstructure, superconducting and pinning properties of $Bi_{1.6}Pb_{0.4}Sr_2Ca_2Cu_3O_{10+\theta}$ (Bi-2223) prepared by the sol-gel route. Using several characterization techniques, including X-rays diffractometry and electrical transport measurements, we find that the powders calcined at 820°C often result in a crystal higher critical current density (J_c) compared those calcined at 830°C. The powder calcined at 820°C and sintered at 850°C (Bi-2223 $_{820}^{850}$) showed the best grain morphology and the largest magnetic hysteresis loop and a J_c equal to 12.94×10^5 A/cm^2, comparable to the best results found in the literature for Bi-2223. The enhancement in J_c for Bi-2223 $_{820}^{850}$ seems to be due to improved grain structure rather than creation of effective pinning centers, because the scaling behavior of flux pinning force densities indicates that the main pinning mechanism for all samples is normal point pinning.

Keywords: *Bi-2223; Heat treatment; Flux pinning; Superconducting properties; Grain morphology*

1. Introduction