

Carbon nanofibers addition on transport and superconducting properties of bulk YBa₂Cu₃O_{7-δ} material prepared via co-precipitation

ABSTRACT

The effects of carbon nanofibers addition on transport and superconducting properties of YBa₂Cu₃O_{7-δ} (Y-123) superconductor were studied. Y-123 was prepared using co-precipitation method for good quality bulk of high temperature superconducting material. Carbon nanofibers with 0.2–0.8 wt% were added into Y-123 superconductors. The samples were characterized using electrical resistance measurement for critical temperature (T_c) and critical current density (J_c), powder X-ray diffraction, scanning electron microscopy and energy-dispersive X-ray analysis. Most of the samples indicated a dominant Y-123 phase of an orthorhombic structure with a minor phase of BaCO₃ and Y-124. Onset critical temperature was found to decrease from 90.5 to 80 K with increasing of carbon nanofibers concentration. The J_c for pure sample is 11 A/cm² at 30 K while the J_c of sample with 0.4 wt% carbon nanofibers is 830 A/cm² at 30 K. Introduction of carbon nanofibers enhanced J_c significantly. However, further addition of carbon nanofibers in Y-123 superconductor caused degradation in J_c.