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## Critical current density improvement of Ag-sheathed BSCCO superconductor tapes

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The  $(\text{Bi}_{1.6}\text{Pb}_{0.4})\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_y(\text{Co}_3\text{O}_4)_x$  superconductor with addition of 0.00 - 0.05 weight per cent of  $\text{Co}_3\text{O}_4$  nanoparticle with average size around  $\pm 4$  nm was prepared using the co-precipitation method. Ag-sheathed Bi-2223 tapes with the highest  $J_c$  of bulk  $(\text{Bi}_{1.6}\text{Pb}_{0.4})\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_y(\text{Co}_3\text{O}_4)_x$  were fabricated using the powder-in-tube (PIT) method. The tapes were heat-treated at 845°C for 50 h. The structure, microstructure and transport critical current density ( $J_c$ ) of the tapes were conducted using X-ray diffraction, scanning electron microscopy and four point-probe respectively. The enhancement of critical current density,  $J_c$  through the addition of  $\text{Co}_3\text{O}_4$  (10 nm) nanoparticles is reported. Our results show that all nanoparticles added samples for bulk and tape showed higher  $J_c$  compared to the non-added samples. The increase in  $J_c$  can be explained as the increase of the flux pinning strength by nanoparticles of  $\text{Co}_3\text{O}_4$  that can act as effective pinning centres or a boost leading to enhancement of  $J_c$  in the Bi-2223 system.

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