Comparative Study Between Similarly Processed $YBa_2Cu_3O_{7-x}$ Films with Y_2BaCuO_5 or $BaSnO_3$ Additions

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Abstract – *A* special $YBa_2Cu_3O_{7-x}$ (YBCO) target with a thin sector of second phase material, in this case either Y_2BaCuO_5 (Y211) or $BaSnO_3$ (BSO), was used to deposit YBCO films with non-layered nanoparticles on single crystal $LaAlO_3$ and biaxially textured Ni-5 wt.% W substrates buffered with CeO_2 and YSZ layers (coated conductors). Although identical processing conditions were used, TEM images indicated that random Y211 nanoparticles in the case of YBCO+Y211, and evenly spaced BSO nanocolumns in the case of YBCO+BSO, form in the YBCO films. While YBCO plane buckling was observed at many places in the case of YBCO+Y211, a high density of stacking faults and dislocations were observed in the case of YBCO+BSO near the BSO columns. In transport critical current density (J_c) angular dependence measurements, the absence of nanocolumns in YBCO+Y211 films resulted in the absence of a peak at 0°, J_c (H//c), in J_c vs. q plots, as compared to a clear peak at 0o observed in YBCO+BSO films with the nanocolumns. The in-field J_c measurements indicated small low-field J_c enhancements at 77 K in YBCO+Y211 films but more than an order of magnitude improvement in high-field J_c in YBCO+BSO films due to the differences in the microstructures.

Index Terms – BaSnO3, Coated conductors, Flux pinning, Pulsed laser ablation, Y211

Manuscript received 19 August 2008.
This work was supported by the AFOSR and the Propulsion Directorate of the AFRL.
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