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Recent results on in-field properties in nanoparticle-doped TFA-MOD $REBa_2Cu_3O_y$ Coated Conductors

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Nanostructural modifications, in particular incoherent nanoparticle additions, have been shown to have great success in improving superconducting material performance[1], such as $REBa_2Cu_3O_y$ (REBCO) superconducting films and iron pnictide films [2,3]. To be effective, the nanoparticle (NP) size has to be tuned, and the density needs to be higher with no degradation of the matrix crystallinity and critical temperature (T_c) for greater enhancement.

We show how it is possible to tune to obtain both small size and high density of NPs while maintaining the crystallinity of the REBCO matrix deposited by metal organic deposition. We get significant improvement of the in-field critical current density (J_c) over a broad temperature range by changing the nanoparticle material and by modulating the precursor chemistry. The enhancements are seen not only in J_c but also in the reduction of the effects of thermal fluctuations (flux creep) over broad ranges of magnetic field and temperature. Moreover, we developed our simple pinning model in the case of adding NPs, and this model is in good agreement with experimental results for both cuprate and pinictide films. Detailed microstructural and superconducting properties for nanocomposite REBCO CCs will be presented.

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