Improvement of flux pinning properties of GdBa$_2$Cu$_3$O$_{7-\delta}$ films with Gd$_2$O$_3$ additions by a post-annealing process


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We report enhanced flux pinning properties of GdBa$_2$Cu$_3$O$_{7-\delta}$(GdBCO) films with Gd$_2$O$_3$ by a post-annealing process. According to our preliminary study on GdBCO coated conductors by the RCE-DR (Reactive Co-Evaporation Deposition & Reaction) process, the post-annealing process can be effective for enhanced flux pinning properties of GdBCO films in which Gd$_2$O$_3$ particles are trapped in GdBCO matrix, since Gd$_2$O$_3$ and GdBCO can react to form rod-shaped clusters of the stacking faults by a post-annealing process in oxygen pressures above ~ 300 mTorr. On the basis of these results, GdBCO films with Gd$_2$O$_3$ which were fabricated by pulsed laser deposition (PLD) using KrF ($\lambda = 248$ nm) eximer laser on CeO$_2$-buffered MgO (100) single crystal substrate were post-annealed at various temperatures of 750 ~800 °C in low oxygen pressures below 1 Torr. Details of the relationship among the post-annealing conditions, microstructure, and superconducting properties of GdBCO CCs are discussed in this presentation.

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