Processing-microstructure-property relationship in $GdBa_2Cu_3O_{7-d}$ coated conductors via the REC-DR process

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Although the RCE-DR process (Reactive Co-Evaporation Deposition & Reaction) is known cost-effective because of its high yield and high production rate, the pinning properties of $GdBa_2Cu_3O_{7-d}$ (GdBCO) coated conductors (CCs) produced by RCE-DR are relatively weaker compared with those of REBCO CCs produced by other processing such as PLD, MOD, and MOCVD. To improve in-field critical current density (J_c), we have tried to refine the Gd_2O_3 particles trapped in the GdBCO matrix by controlling the processing parameters on the basis of the GdBCO stability diagram experimentally determined for the nominal composition of Gd:Ba:Cu=1:1:2.5. Recently, we have succeeded in refining Gd_2O_3 into nanoparticles with the average particle size below 100 nm, resulting in a large isotropic improvement of in-field J_c at 65 and 77 K. In addition, a post-annealing process in low oxygen pressure was also found effective for improving in-field J_c along the c-axis of GdBCO film because of a rearrangement of as-grown stacking faults. In this talk, I will explain the processing-microstructure-property relation in GdBCO CCs via RCE-DR. *This work was supported by the Korea Institute of Energy Technology Evaluation and Planning (KETEP) and the Ministry of Trade, Industry & Energy(MOTIE) of the Republic of Korea (No. 20131010501800).*