WBP7-5

Effect of post-annealing on the pinning properties of $GdBa_2Cu_3O_{7-\delta}$ coated conductors via RCE-DR

*Won-Jae Oh[1], Insung Park[1], Jae-Hun Lee[2], Seung-Hyun Moon[2], Kookchae Chung[3], Sang-Im Yoo[1]

Department of Material Science and Engineering, Research Institute of Advanced Materials (RIAM), Seoul National University, Korea[1]
Superconductor, Nano & Advanced Materials Corporation (SuNAM Co.) Ltd, Korea[2]
Department of Functional Nano Materials, Korea Institute of Materials Science, Korea[3]

We investigated the effect of post-annealing on the pinning properties of $GdBa_2Cu_3O_{7-\delta}$ (GdBCO) coated conductors (CCs) fabricated by the reactive co-evaporation deposition & reaction (RCE-DR) process. On the basis of the stability phase diagram of GdBCO, as-grown GdBCO CCs were post-annealed at the temperatures ranging from 450 to 750℃ in various oxygen pressures. Interestingly, for the same P_{O_2} of 300 mTorr, the $GdBa_2Cu_4O_{16}$ (Gd124) phase was observable in the sample annealed at the temperatures lower than 600℃ while the density of stacking faults (SFs) was decreased in the samples annealed at the higher temperatures of 650 and 750℃. The pinning properties of post-annealed GdBCO samples were sensitive to the annealing conditions, including oxygen pressure, temperatures, and time. In comparison with as-grown sample, the minimum J_c values of samples annealed at 750℃ in the P_{O_2} of 300 mTorr for 5 min are improved at relatively low temperatures in high field region, which is due to a significant reduction in the density of SFs. On the other hand, the GdBCO CCs annealed 500℃ in the P_{O_2} of 300 mTorr for 1 h exhibit enhanced pinning properties at relatively high temperature in low field region, which is ascribed to the formation of Gd124 phase. Detailed relationship between microstructures and pinning properties will be presented for a discussion.

This work (Grants No.S2660496) was supported by project for Cooperative R&D between Industry, Academy, and Research Institute funded Korea Ministry of SMEs and Startups in 2018.