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Investigation of interim heat treatment process on TFA-MOD method for production of $BaZrO_3$ added $REBa_2Cu_3O_y$ coated conductors with high in-field performance

*Koichi Nakaoka[1], Akira Ibi[1], Takato Machi[1], Yukie Usui[1], Teruo Izumi[1]

National Institute of Advanced Industrial Science and Technology[1]

The trifluoroacetate metal-organic deposition (TFA-MOD) method has been commonly recognized as a low-cost technique for production of $REBa_2Cu_3O_y$ (RE: rare-earth, REBCO) coated conductors (CCs), and also considered as having a slightly lower superconducting property comparing with the CCs by the vapour method. On the other hand, low cost CCs with high performance in the magnetic-field have been required for electric power applications. In our previous study, we have developed two new techniques which were called interim-heat-treatment (IHT) [1] and ultrathin-once-coating (UTOC) [2] in order to enhance the in-field critical current density ($J_c(B)$) of $BaMO_3$ (M: metal element) added MOD-REBCO CCs, and achieved significant improvement of the $J_c(B)$ property of CCs. The IHT technique is a process to form an appropriate precursor film before the crystallization process of the REBCO, and the fundamental theoretical analysis of the IHT technique was previously reported [1]. In this study, we have investigated and optimized the effects of IHT atmosphere on the $J_c(B)$ performance of $BaZrO_3$ added $Y_{0.77}Gd_{0.23}Ba_2Cu_3O_y$ (YGdBCO/BZO) CCs. XRD measurements of the film after IHT at 580°C for 240 min under argon atmosphere confirmed the significantly coarsening of CuO. On the other hand, significantly coarsening of CuO was not observed in the film after IHT under oxygen atmosphere. The coarsening of CuO in IHT films is not good for obtaining high superconducting performance of YGdBCO/BZO CCs since that may cause of formation of *a*-axis orientation during the crystallization step [3]. The high $J_c(B)$ value at 77 K and 3 T ($B//c$) of >0.5 MA/cm^2 was obtained for YGdBCO/BHO CC with IHT at 580°C for 240 min under oxygen atmosphere.
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