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Fabrication of additional deposited layer of $\text{GdBa}_2\text{Cu}_3\text{O}_{7-\delta}$ on coated conductors for joint

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$\text{REBa}_2\text{Cu}_3\text{O}_{7-\delta}$ coated conductors (REBCO CCs) have been longed for electric power application with lengthening by superconducting joint due to its high critical temperature (T_c), critical current (I_c), and low toxicity⁽¹⁾⁽²⁾. We have reported jointing GdBCO CCs via crystallization of additional deposited precursor layers on GdBCO CC⁽³⁾, and which showed I_c of 0.096 A/cm^2 ⁽⁴⁾, however that is lower than that of 10^3 A/cm^2 in YBCO c -axis⁽⁵⁾. Existence of secondary phases and voids at joint interface would deteriorate current and formation of them are affected by the structure of additional layer after film growth. In this study, surface morphology of additional layer were observed to clarify the information of microstructure.

Additional layers were fabricated by a metal organic deposition⁽³⁾ method. Firstly, starting solutions were spin-coated onto GdBCO CCs, and the samples were calcined at 823 K. Next, they were heated at 1073 K under the oxygen pressure of 200 Pa to crystallize and oxygenated at 773 K for 2 hours. Then the film surface was observed by a Scanning Electron Microscopy (SEM). Fig.1 show SEM images of film surface of GdBCO layer before (a) and after (b) additional deposition onto GdBCO CC. The contrast difference is small in whole area in Fig.1 (a), showing smoothness. On the other hand, the contrast difference is large in Fig.1(b), showing roughness. In addition, the number of grains is large in Fig.1(b), which indicates the roughness is due to the existence of many grains. The roughness of film surface may cause voids at the joint interface of the jointed sample. It is necessary to fabricate additional layer with smooth surface to increase I_c , so improving heat treatment conditions is needed.

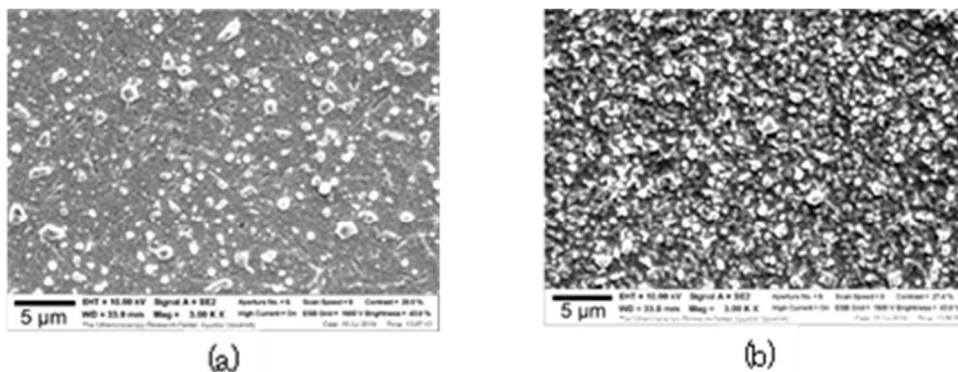


Fig.1 SEM images of film surface of GdBCO layer before (a) and after (b) additional deposition onto GdBCO CC

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