

Optimization of a Surface Coating Technique for the Growth of Single Grain YBCO Bulk Superconductors

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Single grain YBCO bulk superconductor has been widely used for a levitation application such as a contactless bearing of superconductor flywheel energy storage system(SFES). To achieve a large levitation force, the critical current density (J_c), grain size and magnetization properties should be high. To do this, it is necessary to fabricate a single grain YBCO bulk with a strong pinning capacity. Subsidiary nucleation associated with a non-uniform temperature distribution is often observed, which makes it difficult to grow a single YBCO grain. To develop a commercially available cost-effective process, we applied a surface coating technique to the fabrication of a single grain YBCO bulk superconductor. Coating elements were Yb_2O_3 , Y_2O_3 and a mixture of the two oxides, which were prepared by an organic solution or a simple dipping method. The coating materials were pasted on the surfaces of rectangular YBCO bulks with a dimension of 5 cm x 5 cm x 2 cm, and a top seeded melt processing was applied to the YBCO bulks. In this study, we report on the effectiveness of a surface coating on the growth of a single YBCO grain. The details of the growth nature, the levitation force and the trapped magnetic field properties of the YBCO superconductors with various surface coatings are also reported.

Keywords: YBCO superconductor, surface coating, levitation application, melt processing