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Effect of laser energy and laser repetition frequency on BHO shape in PLD method

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For applications of $REBa_2Cu_3O_y$ (REBCO: RE = Rare Earth) high temperature superconductor, REBCO coated conductors (CCs) are required. Problems facing REBCO CCs are reducing production costs and improving critical current density (J_c) in magnetic fields isotropically. We have developed a technique called REBCO Growth using REBCO buffer layer (REGREB) technique which has made it possible to fabricate REBCO CCs with good performance at high production rate. There have been many reports that the J_c in magnetic fields have been improved by the introduction of artificial pinning centers (APCs). However, it is known that $BaHfO_3$(BHO), which is a typical APC, become *c*-axis correlated pinning centers. Therefore, we aimed to establish a technology to control microstructure by Pulsed Laser Deposition (PLD) method in order to improve J_c isotropically.

In this study, we focused on the relationship between laser repetition frequency (f_L) and laser energy (E_L) per pulse in the PLD method and the effect of these on the BHO shape was examined by changing f_L and E_L while keeping a high deposition rate.

Using a KrF excimer laser and a Reel to Reel system, BHO-doped $SmBa_2Cu_3O_y$ (SmBCO) CCs was fabricated on IBAD-MgO tape by the REGREB technique. Three samples were prepared, E_L was changed to 80, 90, and 100 mJ. In order to keep the deposition rate, f_L was set to 100, 70, and 64 Hz, respectively. The deposition rate was 13-18nm/sec.

Fig. 1 shows the angular dependence of J_c (J_c-q) at 77 K and 1 T. All three samples showed curves of almost the same shape. When E_L changes, the amount of evaporation per pulse and the kinetic energy of the evaporated particles would change. However, since the degree of supersaturation is high at the high deposition rate, it is considered that these changes due to E_L did not have a significant effect on the microstructure. Also, J_c peak at the B // c (q = 0°), which is often observed in the BHO-doped samples, was not confirmed. We speculated that the APC did not play *c*-axis pinning center.

We will compare the J_c-q curve at high and low deposition rate in order to clarify the effect of E_L.

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Keywords: REBCO, BHO, Reel to Reel, PLD

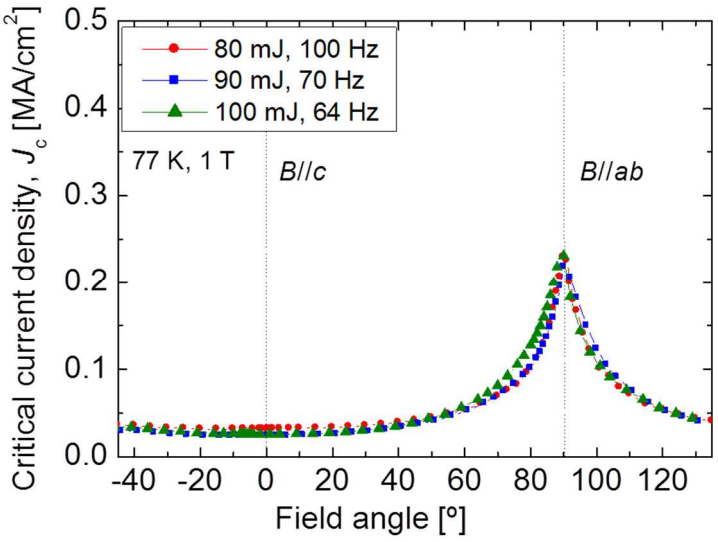

Fig. 1 The angular dependence of J_c (J_c - θ) at 77 K and 1 T.