

The Features and Properties of $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ Films with Different Thicknesses Grown on SrTiO_3 by High Frequency PLD

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It is very important to maintain high J_c value with increasing the thickness of YBCO film to increase the current carrying capacity of coated conductor. YBCO films were deposited with various thicknesses from 100nm to 1.6 μm on single crystal SrTiO_3 substrates by pulsed laser deposition (PLD). The effects of different deposition conditions, especially different deposition rates by means of changing the pulsed laser frequency up to 200Hz, on the J_c value were systematically studied. For YBCO film with the thickness of 200nm, the J_c value of 2.1MA/cm² has been achieved under the high deposition rate of 32 $\text{\AA}/\text{s}$. The J_c can be maintained great than 1M/cm² with the thickness less than 1 μm . The X-ray analysis and SEM were used to examine the texture, crystallization and surface quality. The reason for J_c declining with increasing the thickness was studied and discussed. A-axis orientation of YBCO films was characterized by XRD Chi-scans, which showed that the percentage of a-axis YBCO estimated using the ratio of chi-scan of c-axis and a-axis for YBCO (102) plane increased with thickness. The SEM was employed to analyze the surface of YBCO, and it was shown the surface of YBCO film became rougher with increasing the thickness. There were many large singular outgrowths and networks of outgrowths on the surface of YBCO films which lowered the density of thick YBCO film.

Keywords: pulsed laser deposition, YBCO film, critical current density, texture

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