【22-S13】

Effect of substrate temperature on dislocation as flux pinning centers in high-Tc superconductor $Y_1Ba_2Cu3O_{7-\delta}$ films

박정수[1], V. G. Prokhorov[1,2], 김채옥[1], 이영백[1]
[1] 한양대학교 물리학과
[2] Institute of Metal Physics, Kiev, Ukraine

The substrate temperature dependence of dislocation acting as flux pinning centers in the high-Tc superconductor $Y_1Ba_2Cu_3O_{7-\delta}$(YBCO) film has been examined by a qualitative analysis of the spatial distribution patterns of a high-intensity x-ray diffraction peak in the azimuthal plane near the (005) reciprocal lattice point in order to apply the YBCO film to the passive microwave devices. Thin c-oriented YBCO films were prepared on $LaAlO_3$ (100) substrates at 720 ℃ to 780 ℃ by the conventional laser ablation, and the laser ablation with improved characteristics of the plasma plume and with a slow cooling. An increase in the substrate temperature from 720℃ up to 760℃ leads to an enhancement in the superconducting transition temperature Tc of the films deposited by the conventional laser ablation due to a crystallization. A further increase of the substrate temperature to 780℃ causes a decrease in Tc because of impurity phases. As the substrate temperature increases up to 780℃ for the laser ablation with improved characteristics of the plasma plume, the dislocation content in the YBCO film is decreased. In other words, the elevation of the substrate temperature up to 780℃ makes Tc of the YBCO films enhanced and crysyal structure more perfect. Therefore, a highly textured YBCO film could be produced with the minimum surface resistance R_s and a high Q-factor at a substrate temperature of 780℃ by using this preparation method.