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A study of dependence of dislocation density and magnetic properties on substrate temperature for laser- ablated $Y_1Ba_2Cu_3O_{7-\delta}$ films

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Dislocation density in the $Y_1Ba_2Cu_3O_{7-\delta}$ (YBCO) film has been studied as a function of substrate temperature. In order to apply the YBCO film to the passive microwave devices, the YBCO films were prepared by the conventional laser ablation with improved characteristics of the plasma plume. Dislocation in the YBCO films is investigated by an analysis of the spatial distribution patterns of a high-intensity x-ray diffraction from an azimuthal plane near the (005) reciprocal lattice point. As the substrate temperature is increased up to 780 °C for the laser ablation only with improved characteristics of the plasma plume, the critical temperature of the YBCO film is decreased and the dislocation density is also decreased. Therefore, a high-textured YBCO film could be produced with the minimum surface resistance and a high Q-factor at a substrate temperature of 780 °C by the laser ablation with improved characteristics of plasma plume and with a slow cooling.