

Flux pinning properties of $\text{SmBa}_2\text{Cu}_3\text{O}_y$ films with BaHfO_3 nanorods

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BaHfO_3 (BHO)-doped $\text{GdBa}_2\text{Cu}_3\text{O}_x$ layers on IBAD-MgO tapes by the pulsed laser deposition method shows the high irreversibility field (B_{irr}) over 15T at 77.3K. In this report, $\text{SmBa}_2\text{Cu}_3\text{O}_y$ material is higher T_c and B_{irr} value, therefore we present the superconducting properties and the shape of nanorods depended on growth temperature and its amount of additive in BHO-doped SBCO films. As the results, BHO-SmBCO films in improving its straight of BHO nanorod on the LaAlO_3 substrate has high $F_p=27 \text{ GN/m}^3$ and $B_{\text{irr}}=15.0\text{T}$ (77K). Using the low temperature growth technique with the seed layer, we can design and control the higher density and fine BHO nanorods, as changing lower substrate temperature. Furthermore, slightly bright contrast regions are observed around BHO nanorods by the low-angle annular dark-field scanning transmission electron microscopy. The dislocation positions estimated by the Geometric Phase Analysis (GPA) of STEM images are corresponding to the origin on the radial bright contrast. We considered that the slightly bright contrast region spread in radial is the strain field.

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