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M2Po2A-06 [30]: The Effect of Growth Temperature on the Artificial Pinning Center Landscape in BaHfO3 and Y2O3 Doped YBa2Cu3O7-x Thin Films

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The addition of different insulating, non-reactive nano-phases to YBa2Cu3O7-δ superconductor thin films improves current density by combining different flux pinning mechanisms. Barium Hafnate (BHO) 1D APCs can be tuned by the addition of secondary yttrium oxide (Y2O3) 3D APCs, leading to a different pinning landscape. Thin films are grown via pulsed laser deposition (PLD) by the adsorption of adatoms on a substrate surface. The adsorbed adatoms' mobility results from their kinetic energy and arrival rate at the substrate surface, and along with film-substrate interaction energies, and film-film interaction, dictates growth mode. This paper systematically compares the growth temperature (Tg) effect on BHO 1D APCs by measurement of magnetic and transport current densities, critical temperatures, and microstructure observations via SEM and TEM. Nanocomposite films on LaAlO3 and SrTiO3 substrates were produced via PLD with a target consisting of 4 vol.% BHO +3 vol.% Y2O3 doped YBCO, while varying the growth temperature from 790 C to 825 ℃. Varying the growth temperature affects the microstructural defects within the film, which in turn impacts the pinning strength, current density, and critical temperature. The pinning force density (Fp), and maximum field (Hmax) of the APCs, are increased with Tg at its optimum growth temperature.

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