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M2Po2A-06 [30]: The Effect of Growth Temperature on the Artificial Pinning Center Landscape in BaHfO₃ and Y₂O₃ Doped YBa₂Cu₃O_{7-x} Thin Films

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The addition of different insulating, non-reactive nano-phases to YBa₂Cu₃O_{7-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 (T_g) 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 °C. 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 (F_p), and maximum field (H_{max}) of the APCs, are increased with T_g at its optimum growth temperature.

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