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M2Po2A-07 [31]: The Effect of APC/YBCO Interface on the Angular Range of Effective Pinning by One-Dimensional Artificial Pinning Centers in BaZrO3 /YBa2Cu3O7-xNanocomposite Films

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The APC/YBCO interface has been reported to affect the pinning efficiency of BaZrO3 (BZO) 1D APCs. Here we provide qualitative and quantitative study of the effect of semi-coherent (BZO) interface on the angular range of pinning by 1D BZO APCs in BZO/YBCO nanocomposite films. A good understanding of the nature of the interface, and its effect on the angular range of effective pinning, is crucial to designing APC/YBCO nanocomposites with strong isotropic pinning landscape. The pinning efficiency of the BZO 1D APCs was evaluated at different orientations of the magnetic field (H) in the plane perpendicular to the critical current density Jc (H) from H//c-axis (theta=0 degrees) to H//ab-plane (theta=90 degrees). Specifically, the maximum pinning force density (Fp, max) and the field at which it occurs (Hmax), were measured as functions of theta. Results show that for the BZO 1D APC/YBCO films, significant pinning (relative to undoped YBCO) is not observed until BZO concentration is up to 4 vol.%. This might be in part due to strain field overlap-induced defects reducing the strain on the BZO/YBCO interface. In addition, the angular range was observed to decrease with increasing BZO concentration, suggesting an intimate correlation between the individual 1D APC pinning efficiency and the angular range this efficiency is maintained.

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