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M2Or1B-03: [Invited] Ca-repaired BaZrO3 nanorods/YBa2Cu3O7-x interface for enhanced pinning in YBa2Cu3O7-x nanocomposites with 2-8% BaZrO3 doping

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C-axis aligned BaZrO3 (BZO) nanorods formed via strain-mediated self-assembly in BZO-doped YaBa2Cu3O7-x (BZO/YBCO) nanocomposite films can provide strong pinning to the quantized magnetic vortices. While the strain initiated from the BZO/YBCO lattice mismatch plays a critical role in nucleation and evolution of the BZO nanorods, it also leads to a highly defective BZO/YBCO interface and hence reduced pinning efficiency of BZO nanorods. This work reports a recent study in probing the effect of BZO/YBCO interface on the pinning efficiency of the BZO nanorods as the interface is repaired dynamically during the BZO nanorod growth using Ca doping. Within the BZO doping range of 2-8 vol.%, significantly enhanced pinning efficiency of the BZO nanorods have been observed. A peak enhancement up to five-fold of critical current density at 9.0 T and 65-77 K has been obtained in the 6 vol.% BZO/YBCO nanocomposites after the interface repair. This result not only illustrates the critical importance of the BZO/YBCO interface in the pinning efficiency, but also provides a facile scheme to achieve such an interface to restore the pristine pinning efficiency of the BZO nanorods.

Keywords: YBCO nanocomposite film, artificial pinning center, vortex pinning efficiency, coherent interface, dynamic lattice enlargement

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