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M2Or2B-02 [Invited]: Controllable generation of strong and isotropic artificial pinning centers in YBCO films

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Raising critical current density Jc in high temperature superconductors (HTS), such as YBa2Cu3O7, is an important strategy towards commercial applications. Development of strong nanoscale artificial pinning centers (APCs) in APC/YBa2Cu3O7 nanocomposites represents one of the most exciting progress in recent HTS material research. Significantly raised in-field Jc has been demonstrated in APC/YBa2Cu3O7 nanocomposites. Among other processes, strain-mediated self-organization has been explored extensively for in situ formation of the APCs of a large variety of materials. The effort in controlling the pinning landscape, prompted by the initial success in self-assembly of APCs, has led to a fundamental question on how strains interact at microscopic scales in determining the morphology, concentration, and pinning efficiency of APCs. Answering this question is the key to enable optimal APC landscape to be achieved in APC/YBa2Cu3O7 nanocomposites. The talk intends to highlight some recent progress made in controllable generation of APCs using an interactive modeling-synthesis-characterization approach. Emphasis will be given to the understanding on the collective effect of strain field on the morphology, concentration and pinning efficiency of single-/double-doped APCs in the APC/YBa2Cu3O7 nanocomposite films.

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