Study of YBCO-BZO pinning properties grown by PLD and MOD techniques

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Thin films of $YBa_2Cu_3O_{7-x}$ (YBCO) and YBCO with $BaZrO_3$ (BZO) addition have been deposited by Pulsed Laser Deposition (PLD) and MetallOrganic Decomposition (MOD) techniques. D.C. electrical characterizations performed at different temperatures (from 85 to 10 K) and magnetic field direction and intensity (0-12 T) have revealed that, regardless of the growth method, the introduction of BZO second phase affects the field dependences of pinning efficiency and gives rise to an improvement of the maximum pinning force (from 4.5 to 11.5 GN/m^3 at 77K in PLD films and from 0.5 to 5 GN/m^3 at 77K in MOD films). The dependences of the critical current density from the direction of the applied magnetic field are in accordance with the defects nature as observed by TEM measurements: c-axis self-assembled columnar defects acting as a strongly correlated pinning source in PLD films and randomly distributed nano-particles in MOD films giving rise to isotropic pinning. However, the analysis of the angular dependences by means of different models, accounting for YBCO mass anisotropy and statistical arrangements of the flux line lattice, revealed that a strong correlated contribution to the pinning force can be assumed in both cases.