

Nanocomposites and nanomaterials

Electrodynamic properties of high- T_c superconductor PLD thin films $YBa_2Cu_3O_{7-x}$ with a different nanostructure

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The results of complex research on relation of electrodynamic and structural characteristics in high- T_c superconductor (HTS) $YBa_2Cu_3O_{7-\delta}$ (YBCO) quasi-single-crystalline thin films with different concentration (a few mass percents) of nano-sized $BaZrO_3$ (BZO) inclusions are presented. The nanostructure of the films under study was investigated by use of high-resolution electron microscopy (HREM). This study allowed to determine the main type of defects, which result in strong pinning of Abrikosov vortices and large critical current densities, respectively [1,2]. The results on theoretical modeling of defect nanostructure and its influence on the critical current density value are also presented. We have experimentally studied magnetic and transport properties of the deposited YBCO(BZO) thin films. The temperature and magnetic field dependencies of the critical current density in the films under study are found. We have also performed microwave measurements, which concern high-frequency properties of YBCO(BZO) thin films, namely – the microwave surface impedance was measured both in linear and nonlinear regimes. The obtained experimental results are discussed basing on the phenomenological theory for vortex pinning and dynamics in anisotropic type –II superconductors with strong pinning sites. The influence of nanostructure, which is formed due to BZO admixture phase in YBCO(BZO) thin films, on electrodynamic properties at low and high frequencies is analyzed for these films.

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2. Svetchnikov V.L., Flis V. S., Kalenyuk A. A., Kasatkin A. L., Rebikov A.I., Moskaliuk V.O., Tretiatchenko C.G., Pan V.M. Nanotechnology as a way to overcome the rapid J_c fall with HTS film thickness // *J. Phys.: Conf. Ser.* -2010.- **234**.- P. 012041 (1-11).