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Magnetic Study on $Yb_{a2}Cu_3O_{7-\delta}$ Nanoparticles Doped by Ferromagnetic Nanoparticles of $Y_3Fe_5O_{12}$

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Abstract : Present and future industrial uses of high critical temperature superconductors require high critical temperatures TC and strong current densities JC. These two aims constitute the two motivations of scientific research in this domain. The most significant feature of any superconductor, from the viewpoint of uses, is the maximum electrical transport current density that this superconductor is capable of withstanding without loss of energy. In this work, vortices pinning in conventional and high-TC superconductors will be studied. Our experiments on vortices pinning in single crystals and nanoparticles of $YB_{a2}Cu_3O_{7-\delta}$ and $La_{1.85}$ $Sr_{0.15}CuO$ will be presented. It will be given special attention to the study of the $YB_{a2}Cu_3O_{7-\delta}$ nanoparticles doped by ferromagnetic nanoparticles of $Y_3Fe_5O_{12}$. The ferromagnetism and superconductivity coexistence in this compound will be demonstrated, and the influence of these ferromagnetic nanoparticles on the variations of the critical current density JC in $YB_{a2}Cu_3O7_{7-\delta}$ nanoparticles as a function of applied field H and temperature T will be studied.

Keywords : superconductors, high critical temperature, vortices pinning, nanoparticles, ferromagnetism, coexistence
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