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Pinning Force and critical properties in YBa2Cu3O7-δ

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In this work we have studied the critical properties of YBa2Cu3O7-δ thin films. The studied sample YBa2Cu3O7-δ is a monocristalline thin film deposited by the ablation laser method on the surface (001) of a SrTiO3 substrate. We have examined the variation of critical density Jc as a function of temperature for different values of a fixed magnetic field. This investigation shows that, in the absence of thermal activation and for the weaker values of magnetic field, Jc exhibits a behaviour according to [1-(T/Tc)2]m' with a critical exponent m'varying with a variation of magnetic field. On the other hand, we studied the variation of m'parameter with the pinning force variation Fp for different value of magnetic field. More scaling formulas were used to adjust our results in a large range of temperature and field, different parameters depending on the pinning mechanism such as m, γ, n and δ were determined. m and γ represent respectively the temperature and magnetic field dependence. Moreover, the values of m are related to the pinning force variation. The calculated value of n is compared with other investigations results, n is a good parameter reflecting the anisotropy of superconductor's. Flux pinning mechanism of YBa2Cu3O7-δ has been also investigated by magnetic measurements. The field dependence of critical current density Jc (H) was studied within the collective pinning model. The main results in our research are the dependence of the parameters m and m'to the volume density of pinning force in the Kramer model.

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