Hall Effect in $La_{2-x}Y_xCuO_4$ Superconducting Thin Films

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We have measured the Hall effect in $La_{2-x}Y_xCuO_4$ thin films for a different Y content. Grown by molecular beam epitaxy, this new $La_{2-x}Y_xCuO_4$ compound is surprisingly a superconductor, even though the doping of Y into the same valence of +3 indicates a constant charge valence. The superconducting transition temperature of this compound is 16.7 K (T_c^{onset}) and 13.6 K (T_c^{onset}), for x = 0.2 and x = 0.25 respectively. This compound is a type of T' system, similar to others, such as $Nd_{2-x}Ce_xCuO_{4\pm y}$. The characteristics of the linear resistivity in temperature of high-temperature superconductors and T^2 dependence of the cotangent of Hall angle, $\cot\Theta_H$, are longer present. For x = 0.2, the sign changes of the Hall coefficient from 20 K to 300 K, from positive to negative and then positive again, indicate the competition between the hole and the electron band in this compound. Curiously enough, in the mixed state, the longitudinal resistivity shows typical behavior of the conventional superconductor for H||c-axis, but the behavior of the high-temperature superconductor is shown for H||ab-plane. The sign reversal normally found in the Hall resistivity in mixed state is not observed.

keywords : T'-system, superconductivity, Hall effect