

Sign reversal of the Hall resistance in the mixed-state of electron doped superconducting thin films (LT26)

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We have studied the transport properties of $\text{La}_{1.89}\text{Ce}_{0.11}\text{CuO}_4$ (LCCO) and $\text{La}_{1.89}\text{Ce}_{0.11}(\text{Cu}_{0.99}\text{Co}_{0.01})\text{O}_4$ (LCCO:Co) superconducting thin films. When the external field \mathbf{H} is applied perpendicular to the thin films, an abnormal double sign reversal of the Hall voltage in the mixed state of LCCO:Co thin films is observed whereas a single sign reversal is detected in LCCO. If the magnetic field is tilted away from the plane of the film, the double sign reversal of the Hall resistance in LCCO can also be observed. We find that the transition from one to two of the Hall sign reversal can be attributed to the change in the pinning strength from strong to weak. We explain the temperature or field dependent Hall sign reversal by either the magnetic impurities in LCCO:Co or the coupling between the pancake vortices and the in-plane Josephson vortices in LCCO.