GIANT SPONTANEOUS HALL EFFECT AND MAGNETORESISTANCE IN $La_{1-x}Ca_xCoO_3$ ($0.1 \leq x \leq 0.5$) EPITAXIAL FILMS*.

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We report studies of the hall effect and magnetoresistance in $La_{1-x}Ca_xCoO_3$ (x = 0.1, 0.2,0.3,0.5) epitaxial films. An unprecedentedly large spontaneous Hall effect for $La_{1-x}Ca_xCoO_3$ with Ca-doping above the ferromagnetic percolation threshold ($0.2 \leq x \leq 0.5$) is found. The Curie temperatures (T_C) determined from the magnetization versus temperature measurements are T_C = 110 K, 180 K and 185 K for x = 0.2, 0.3, and 0.5, respectively, and the zero-ficlcl resistivity indicates metallic behavior in samples with x = 0.3 and 0.5, and insulating behavior for x = 0.1 and 0.2. The giant spontaneous Hall effect in the ferromagnetic samples exceeds existing theoretical predictions for the value of the spontaneous Hall resistivity ρ_{xy} by many orders of magnitude. The Hall effect is the strongest for x = 0.2, which is a doping level nearest to the ferromagnetic percolation threshold in $La_{1-x}Ca_xCoO_3$. We suggest that tile coexistence of high- and low-spin configurat ions in the perovskite cobaltites, together with the magnetic percolation behavior, may be responsible for the giant Hall effect. On the other hand, all samples exhibit negative magnetoresistance and resistive hysteresis as a function of the field is observed at low temperatures. The maximum magnitude of the negative magnetoresistance in metallic samples is generally smaller than that in the insulating samples. Furthermore, we find that the maximum magnetoresistive effect in tile ferromagnetic samples (x = 0.2, 0.3, 0.5) occurs at T_C, suggesting that the negative magnetoresistance in $La_{1-x}Ca_xCoO_3$ is associated with the suppression of spin fluctuations.

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