NORMAL-STATE HALL EFFECT IN HIGH-\textit{T}_c \text{La}_{2-x}\text{Sr}_x\text{CuO}_4 \text{ AT LOW TEMPERATURES}

F. Balakirev, J.B. Betts, A. Migliori (NHMFL, LANL), G.S. Boebinger (FSU, Physics) I. Tsukada, Y. Ando (CRIEPI, Tokyo, Japan)

Introduction

We investigated low-temperature Hall coefficient ($R_{H}$) in the normal state of the high-$T_c$ superconductor \text{La}_{2-x}\text{Sr}_x\text{CuO}_4 (LSCO). We were able to measure the Hall coefficient at temperatures as low as 0.6K by suppressing the superconductivity with a 65T pulsed magnetic field at NHMFL-LANL pulsed magnet facility. Several LSCO thin film samples were prepared by laser ablation technique with varying levels of Sr doping ($x=0.08, 0.12, 0.16$). The superconducting state in this compound is realized by doping Cu-O planes with holes via partial substitution of La with Sr. The highest superconducting transition temperature ($T_c$) in LSCO is achieved at Sr concentration $x=0.16$.

Temperature dependencies of $R_H$ at 65T in 3 LSCO thin film samples with different levels of Sr doping are plotted on Fig. 1. We found that at the low temperature limit $R_H$ becomes independent of temperature in optimally doped sample ($x=0.16$) and in a slightly underdoped sample ($x=0.12$), while in the most underdoped sample ($x=0.08$) $R_H(T)$ rapidly increases as temperature decreases below 10K. The observed variation of the normal state Hall coefficient as a function of temperature and doping is similar to $R_H$ behavior in another high-temperature superconductor $\text{Bi}_{2}\text{Sr}_{2-x}\text{La}_x\text{CuO}_{6+\delta}$ reported previously [1]. We plan to extend the measurements of Hall effect in La$_{2-x}$Sr$_x$CuO$_4$ to wider range of carrier concentrations to provide a better understanding of the nature of normal state of high-$T_c$ cuprates.

![Figure 1](image_url)

**Figure 1.** Temperature dependence of Hall coefficient at 65T in La$_{2-x}$Sr$_x$CuO$_4$ thin film samples with different levels of Sr doping $x$.

References