The study of Magnetoresistivity in 10% Ag dopped HTS Bi_2Sr_2 $CaCu_2O_x$

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The Magnetoresistance of 10% Ag dopped Bi- Sr- Ca- Cu-O system within its superconducting transition region was studied. In low magnetic fields the square of Magnetoresistance was found to show a linear dependance of H. The results have been explained in terms of randomly diluted Josephson junction present in the sample.

Keywords: Magnetoresistance, Hall geometry, Superconductivity.

1. INTRODUCTION

The discovery of superconductivity in the *Bi- Sr- Ca- Cu-O* system [1] and the subsequent identification of 2212 as the superconducting phase are important from the scientific and application point of view as it does not contain a rare earth ion. One of the features of this system is its rather broad resistive transition compared to other ceramic superconductors [2, 3]. The large transition width can be put to advantage for studying various physical properties within this region [4]. In present attempt we have studied the effect of magnetic field on AC resistance of Ag doped Bi_2Sr_2 $CaCu_2O_x$ in its transition region.

2. EXPERIMENTAL STUDY

Superconducting sample was prepared by mixing Bi_2O_3 , PbO, $SrCO_3$,$CaCO_3$ and CuO and calcinating at 800^0C for 24 hour in air with intermediate grinding. The precursor powder was mixed with 10wt% Ag powder pressed into palette and centered at 800-840^0C in oxygen-nitrogen mixtures with Po_2 = 0.010-1.000 atm for 50 h. For comparison sample without Ag additions were also prepared by the same processing route[5, 6].

The samples. were cut into rectangular shapes and silver electrodes were vacuum evaporated. thin silver wire were shoulder with the indium metal and the sample was glued to a thin glass plate with the help of varnish. The sample with electrode for four prob AC resistance measurements was directly immersed into liquid nitrogen in a quartz tube placed between the two poles of an electromagnet.

3. RESULTS AND DISCUSSION

Figure 1 shows variation of resistance with temperature of sample used for magnetoresistance measurements. It is seen that at liquid nitrogen temperature the resistive transition is almost complete and thus the sample is in a mixed state where the

all superconducting chulster are not interconnected.

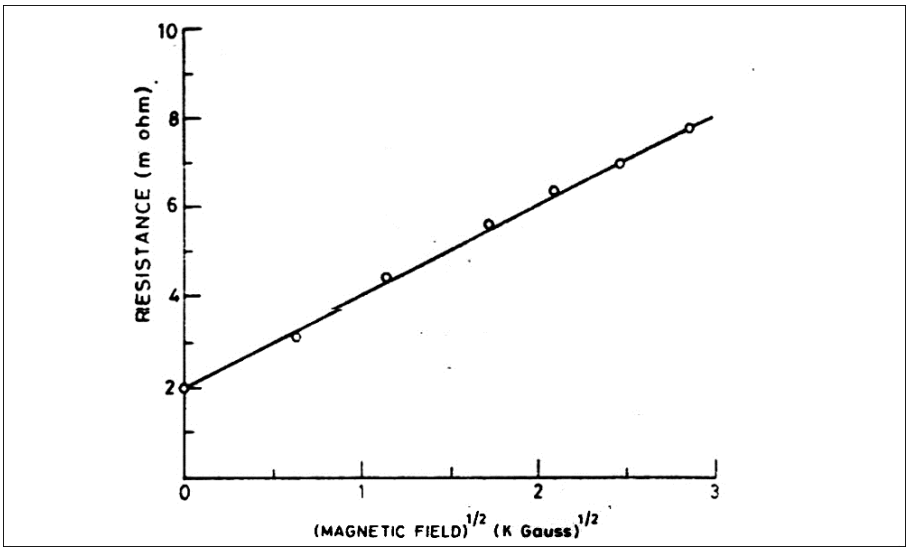

Fig. 1: Variation of resistance with temperature of 10% Ag doped HTS Bi_{2212}.

Variation of AC resistance as a function of increasing magnetic field is depicted in figure 2. It is Apparent that measured resistance of the sample is the square root of the applied magnetic field. It can be noticed that the plot is linear up to a magnetic field of order ~ 8 kG. At low magnetic field it was found to show a quadratic dependene.

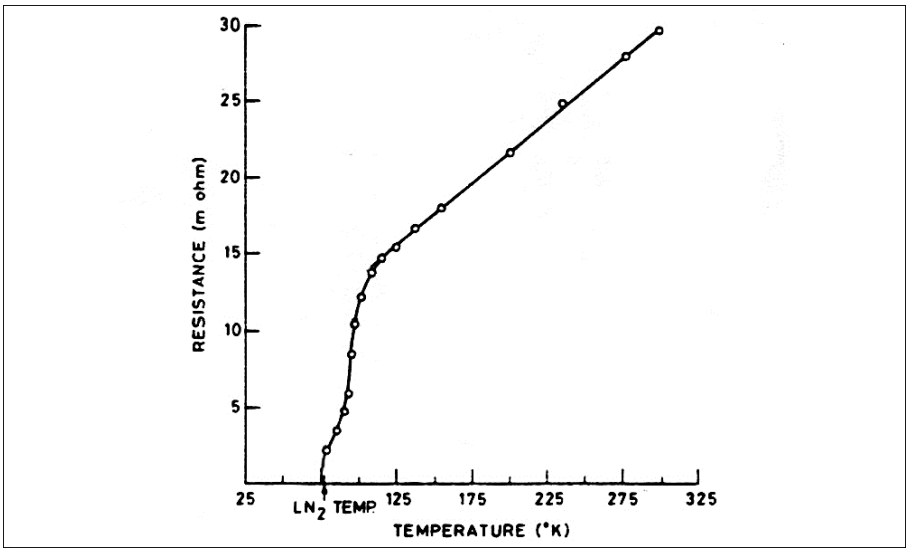

Fig. 2: Variation in magnetoresistance as a function of $\sqrt{H}$.

All the three superconductor system shows a similar double step J_c characteristic. At very low field J_c is constant up to the first step, which occurs between about 0.3 to 30mT. Depending on the sample, the decrease in J_c at this first step varies from about one to two order of magnitude and the magnetic field where the stap starts varies form 0.3 to 2mT. At fields higher than about 30mT, there is a plateau region. At still higher magnetic fields there is a second drop in J_c for all the three bulk sintered superconductor systems. This second step start at about 0.3T with J_c reaching negligibly small values between about 1 and 10T depending on the superconductor.

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