

E1-08 Construction of resistivity probe and resistance measurements on $\text{YBa}_2\text{Cu}_3\text{O}_7$ superconductors

F C Ragel¹, N Pathmanathan¹, J C N Rajendra¹, S G Raymond¹, K Ganesan¹, Cao Liezhao²
¹Dept of Physics, Eastern University, ²Dept of Physics, University of Science and Technology of China

Scientists world-wide are in search for superconductors with higher superconducting transition temperatures. If room temperature superconductors are discovered it would certainly bring a revolution in technology. The simplest method to determine the transition temperature of a superconductor is to measure its d.c. electrical resistance against temperature. At superconducting transition, its electrical resistance abruptly falls to zero. In this work, a Resistivity Probe has been constructed to measure electrical resistance and the corresponding temperature of a superconducting sample. Although apparatus for such purposes are commercially available, this construction is with locally available resources at low cost.

The construction is to achieve and control the sample temperature around 77K and above by immersing the probe into liquid nitrogen, and to measure electrical resistance of the sample at these low temperatures. The heat flow from the surrounding to the sample is minimised by using stainless steel walls and evacuating the probe.

The temperature of the sample is controlled by electrical heating, and the temperature is measured by a Rh-Fe resistant thermometer.

It has been ensured from experiments that the vacuum system, electrical heating and thermometry of the Resistivity Probe function satisfactorily in controlling and measuring the temperature of the sample holder. Further, resistance measurements on two $\text{YBa}_2\text{Cu}_3\text{O}_7$ superconductors were carried out and their superconducting transition temperatures were found to be $T_0 = 89.8 \text{ K}$ and $T_0 = 88.0 \text{ K}$.