

## ABSTRACT

Two system of superconductors viz. Y-Ba-Cu-O (123) and Bi-Sr-Ca-Cu-O (2122) system of oxides have been investigated to understand in what way the  $\text{CuO}_2$  layers, induced defects and mixed valence states of copper ions take part in the transition. The variation of defects in the samples has been effected in the following ways :

- (i) In the 123 system by replacing  $\text{Y}^{3+}$  ion by  $\text{Gd}^{3+}$ ,  $\text{Dy}^{3+}$ ,  $\text{Nd}^{3+}$  and  $\text{Sm}^{3+}$  ions of different ionic radii ;
- (ii) In the 2122 system, by changing the proportion of  $\text{Ca}^{2+}$  and  $\text{Sr}^{2+}$  and of Bi and Cu ions of different charge states ;
- (iii) In the Bi-Sr-Ca-Cu-O system Pb was added to replace Bi to some extent to stabilize 2223 system ;
- (iv) By changing the annealing temperature and annealing time.

Different transport coefficient viz. electrical conductivity, Hall coefficient, Thermoelectric power, Transverse magneto-resistance were measured from  $T_c$  to room temperature. Carrier concentration of charge carriers, effective mass, Fermi energy, Carrier-phonon coupling constant, superconducting energy gap parameter, Hall mobility, drift mobility and effective Bohr magneton have been calculated using simplest theories of metals and alloys. Assuming the contribution of Cu(3d) band as heavy holes and that of O(2p) band as light holes to the transport process, the temperature dependence of Hall coefficient and resistivity have been explained. The temperature variation of resistivity is due to light hole-phonon scattering and the reason for the decrease of Hall coefficient with increase in temperature is the increase in carrier concentration.