

## EFFECT OF HEATING RATE ON THE PROPERTIES OF BISMUTH-BASED SUPERCONDUCTING MATERIALS

Rashid Mehmood and Muhammad Javed Iqbal

*Department of Chemistry, Quaid-i-Azam University, Islamabad 45320, Pakistan.*

*emails: mjiquauchem@yahoo.com and rashid\_meh786@yahoo.com*

### **Abstract:**

Bismuth based superconducting materials having a general formula  $\text{Bi}_2\text{xPb}_{0.4}\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_y$  (where  $x = 0.1, 0.2, 0.3$  and  $0.4$ ) were synthesized by the simple solid-state reaction method. Each of the samples was initially calcined at three temperatures of  $790^\circ\text{C}$  at different heating rates of  $2, 5, 10, 14$  and  $20\text{ }^\circ\text{C min}^{-1}$  for 24h. The sample pellets were sintered in air at three different temperatures of  $835^\circ\text{C}$  for 48 h at the heating rates given above. The lattice parameters ( $a, b$  and  $c$ ) and unit cell volume,  $V_{\text{cell}}$ , of the samples were calculated by X-ray diffraction (XRD). The dc electrical resistivity and ac magnetic susceptibility measurements show that the sample with the value of  $x = 0.3$ , sintered at  $835^\circ\text{C}$ , at a heating rate of  $14\text{ }^\circ\text{C}\text{.min}^{-1}$  has the highest percentage of the high- $T_c$  (2223) phase, the highest value of  $T_{c(0)} = 106\text{ K}$  and the lowest room temperature resistivity value.

**Keywords:** Electrical measurements, energy dispersive x-ray diffraction, high-temperature superconductors.