

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: mjiqauchem@yahoo.com and rashid_meh786@yahoo.com

Abstract:

Bismuth based superconducting materials having a general formula $\text{Bi}_{2-x}\text{Pb}_{0.4}\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_y$ (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°C at different heating rates of 2, 5, 10, 14 and $20^\circ\text{C min}^{-1}$ for 24h. The sample pellets were sintered in air at three different temperatures of 835°C for 48 h at the heating rates given above. The lattice parameters (a , b and c) and unit cell volume, V_{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°C , at a heating rate of $14^\circ\text{C.min}^{-1}$ 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.