Research Title   Studies on the Chemical Constituents of Bi-Ca-Sr-Cu-O

Superconductors

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ABSTRACT

In this research project, the effect of Pb and Ba addition on the superconductivity of the high T_c superconductor $Bi_2Ca_2Sr_2Cu_3O_z$ was studied. $Bi_{2-x}Pb_xCa_2Sr_{2-y}Ba_yCu_3O_z$ was prepared by using evaporation to dryness method. The starting compounds were Bi_2O_3, $SrCO_3$, $CaCO_3$, CuO, $Pb(NO_3)_2$ and BaO. The metal ion solutions were prepared in nitric acid. Appropriate volumes of each solution were mixed to obtain the desired atomic ratio. The precipitated powder was calcined at temperatures in the range of 800-830°C and then pressed into pellets under an applied pressure of 10 tons/cm^2. These pellet samples were subsequently sintered

at temperatures between 840-870°C. It was found that these samples showed a Meissner effect at a temperature above the boiling point of liquid nitrogen and that the critical temperature (T_c) was observed to depend on the quantities of the added Pb and Ba in the sample. The maximum T_c was about 107 K while the T_c onset was 120 K when $x = 0.6$ and $y = 0.1$. Elemental analysis of the prepared materials demonstrated that the atomic ratio of the major elements were unchanged but the added Pb decreased about 10-20 %, probably owing to loss of Pb during the heat treatment process. The peroxide contents in the superconducting materials tended to increase with their T_c values. The crystal structure of the sample with the T_c of 107 K was identified by means of X-ray diffraction spectrometry and found to be tetragonal, with lattice parameters of a = b = 5.40 Å and c = 37.51 Å.