INFLUENCE OF Pb/Bi SUBSTITUTIONS ON THE PROPERTIES OF Pb1212 COMPOUNDS

Polycrystalline samples of $(Pb_{1-y}Cu_y)Sr_2(Y_{1-x}Ca_x)Cu_2O_{7-\delta}$, (Pb1212) $0 \leq x \leq 0,3$) were prepared to study the influence of Pb/Bi substitution on its physical properties. Ceramic HTSC samples of $(Pb_{1-y}Cu_y)Sr_2(Y_{1-x}Ca_x)Cu_2O_{7-\delta}$, (Pb1212) $0 \leq x \leq 0,3$) were synthesized by standart solid-state reaction from the starting materials Bi_2O_3, PbO, $SrCO_3$, Y_2O_3, $CaCO_3$ and CuO. In the first stage a mixture of powders taken in stoichiometric ratio calculated carefully grinded in the agate mortar and annealed in porcelain crucibles in a muffle furnace for 48 hours at 900°C in the disappearance of the characteristic absorption bands of CO_3^{2-} in IR spectra (with intermediate grinding). After that the powder was properly mixed in agate mortars and pressed into pellets. The pellets were sintered for 72 hour at temperatures 850–900°C in air. A second annealing was performed at 750°C in flowing O_2 for 8 h. The X-Ray diffraction patterns reveals that all the compounds are crystallized in space group P4/mmm R123 structure and show mainly the formation of the tetragonal Pb1212 phase. Dependence of lattice parameters from the displacement degree x was studied. Change of lattice parameters related to a possible transition Pb^{2+}/Pb^{4+}. It's adjusted that for solid solutions $(Pb_{1-y}Cu_y)Sr_2(Y_{1-x}Ca_x)Cu_2O_{7-\delta}$, (Pb1212) $0 \leq x \leq 0,3$) have superconductivity properties in temperature interval bellow 77–300 K. Our study reveals that superconductivity and structure stabilization in Pb-based are more critical to sintering conditions that other cuprates. The SEM images of the objects under investigation show particles of different shape which have diameter 1 μm. Therefore, findings suggest that with increasing degree of substitution x an increase in the volume of the unit cell is shown that one of the main factors that affect the crystallographic features of this system is the ratio of cations Pb: Cu: Bi.

Key words: high temperature superconductors, Pb1212 , solid-state synthesis.