Phase Evolution and Superconducting Properties of Boron-doped (Bi,Pb)-2223 HTSs

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Two series of the nominally pure (control) and boron-doped (Bi,Pb)-2223 HTSs with nominal composition Bi1.7Pb0.3Ca2Sr2Cu3BxOy (x=0, 0.05, 0.5, 1.5) were prepared under the different conditions: in an alumina crucibles and on an alumina plates. The influence of boron-doping as well as annealing conditions on the high-Tc 2223 phase evolution was studied using X-ray diffraction (XRD), resistivity and AC susceptibility measurements. Obtained results indicate that boron dopant drastically accelerates the formation of (Bi,Pb)-2223 HTS synthesized in alumina crucibles. The boron-doped sample with x=0.5 revealed significant improvement in the zero resistivity temperature compared to the control sample (from 72K up to 100K). On the other hand, the additives of boron (x=0.05 and 0.5) have shown to have a beneficial effect on the formation of (Bi,Pb)-2223 HTSs prepared by the heat treatment of Bi1.7Pb0.3Ca2Sr2Cu3BxOy precursors on alumina plates, although do not essentially affect the critical temperature Tc(zero)=102 K of nominally pure compound. Acknowledgement: This work has been fulfilled by financial support of the Shota Rustaveli National Science Foundation (Grant GNSF/ST09-844-7-121).