## Influence of Sr(BO2)2 Doping on Superconducting Properties of (Bi,Pb)-2223 Phase

Authors : N. G. Margiani, I. G. Kvartskhava, G. A. Mumladze, Z. A. Adamia

**Abstract :** Chemical doping with different elements and compounds at various amounts represents the most suitable approach to improve the superconducting properties of bismuth-based superconductors for technological applications. In this paper, the influence of partial substitution of Sr(BO<sub>2</sub>)<sub>2</sub> for SrO on the phase formation kinetics and transport properties of (Bi,Pb)-2223 HTS has been studied for the first time. Samples with nominal composition Bi < sub > 1.7 < /sub > Pb < sub > 0.3 < /sub > Sr < sub > 2-

x</sub>Ca<sub>2</sub>Cu<sub>3</sub>O<sub>y</sub>[Sr(BO<sub>2</sub>]<sub>2</sub>]<sub>x</sub>, x=0, 0.0375, 0.075, 0.15, 0.25, were prepared by the standard solid state processing. The appropriate mixtures were calcined at 845 <sup>o</sup>C for 40 h. The resulting materials were pressed into pellets and annealed at 837 <sup>o</sup>C for 30 h in air. Superconducting properties of undoped (reference) and Sr(BO<sub>2</sub>)<sub>2</sub>-doped (Bi,Pb)-2223 compounds were investigated through X-ray diffraction (XRD), resistivity (&rho;) and transport critical current density (J<sub>c</sub>) measurements. The surface morphology changes in the prepared samples were examined by scanning electron microscope (SEM). XRD and J<sub>c</sub> studies have shown that the low level Sr(BO<sub>2</sub>)<sub>2</sub> doping (x=0.0375-0.075) to the Sr-site promotes the formation of high-T<sub>c</sub>phase and leads to the enhancement of current carrying capacity in (Bi,Pb)-2223 HTS. The doped sample with x=0.0375 has the best performance compared to other prepared samples. The estimated volume fraction of (Bi,Pb)-2223 phase increases from ~25 % for reference specimen to ~70 % for x=0.0375. Moreover, strong increase in the self-field J<sub>c</sub> value was observed for this dopant amount (J<sub>c</sub>=340 A/cm<sup>2</sup>), compared to an undoped sample (J<sub>c</sub>=110 A/cm<sup>2</sub>=123 superconductor can be attributed to the acceleration of high-T<sub>c</sub>=23 superconductor can be attributed to the acceleration of high-T<sub>c</sub>=24 sub>c</sub>=110 A/cm<sup>2</sub>=10 superconductor can be attributed to the acceleration of high-T<sub>c</sub>=24 sub>c</sub>=110 superconductor can be attributed to the acceleration of high-T<sub>c</sub>=24 sub>c</sub>=110 A/cm<sup>2</sub>=24 sub>c</sub>=110 A/cm<sup>2</sub>=24 sub>c</sub>=110 A/cm<sup>2</sub>=24 sub>c</sub>=24 sub>c</sub>=24 sub>c</sub>=24 sub>c</sub>=24 sub>c</sub>=24 sub>c</sub>=24 sub>c</sub>=24 sub>c</sub>=24 sub>c</sub>=24 sub<sup>2</sub>=24 sub>c</sub>=24 sub>c</sub>=

**Keywords :** bismuth-based superconductor, critical current density, phase formation, Sr(BO<sub>2</sub>)<sub>2</sub> doping **Conference Title :** ICSST 2018 : International Conference on Superconductivity and Superconductor Technology **Conference Location :** Barcelona, Spain

Conference Dates : October 29-30, 2018