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DIELECTRIC AND TRANSPORT PROPERTIES OF AG NANOPARTICLES ADDED $Bi_{1.7}Pb_{0.3}Sr_2Ca_2Cu_3O_{10+\delta}$ SUPERCONDUCTOR COMPOUND

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Abstract

The dielectric properties of $Bi_{1.7}Pb_{0.3}Sr_2Ca_2Cu_3O_{10+\delta}$ superconductors have been studied to investigate the effects of Ag nanoparticles (20 nm) addition on the Bi(Pb)-2223 superconducting system. Superconductor samples were prepared by a conventional solid-state reaction method and systematically studied for their superconducting properties. The Ag nanoparticles concentration x varied from 0.0 to 0.9 wt% of the sample's total mass. The x-ray diffraction (XRD) measurement was performed for phase identification and determination of the crystal structure, reveals that all the samples crystallize in orthorhombic structure. The critical transition temperature (T_c) measured by the standard DC four-probe method and was found to have optimal value at x=0.9 wt%. The role of addition in modifying the dielectric properties, such as dielectric constants ($\varepsilon_r$and ε_i), the dielectric loss ($\tan\delta$) and the ac-conductivity (σ_{ac}) by means of capacitance (C) measurement has been studied at test frequencies (f) in the range of 50 Hz to 1 MHz. These dielectric properties have been investigated in the normal state of the samples at room temperature. From these analyses, we determine the excess conductivity in the superconducting state (lower energy state) of the system and suggest its possible role in the mechanism of superconductivity.

Keywords: dielectric constants, Bi(Pb)-2223, Ag nanoparticles, carrier concentration,

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