

AC losses in Sn-doped $\text{Bi}_{1.6}\text{Pb}_{0.4}\text{Sr}_2(\text{Ca}_{1-x}\text{Sn}_x)_2\text{Cu}_3\text{O}_\delta$ superconductors

ABSTRACT

Measurements of complex AC susceptibility $\chi = \chi' + j\chi''$ as a function of temperature have been carried out on Sn-doped $\text{Bi}_{1.6}\text{Pb}_{0.4}\text{Sr}_2(\text{Ca}_{1-x}\text{Sn}_x)_2\text{Cu}_3\text{O}$ superconductor samples prepared via the conventional solid state reaction method. All the samples exhibit perfect diamagnetism below 109 K. The $\chi''(T)$ curves display two-step features, indicating the presence of mixed phases and therefore weakening of the grains' coupling. The amount of shielded volume in Sn-free samples is greater than that in Sn-doped samples. The intrinsic peak due to the small AC losses within the grain was not observed in the $\chi''(T)$ curves for all samples. However, the coupling peak, TP, for Sn-free samples at an applied field of 1.0 Oe was observed at 89 K and shifted to a lower temperature ranging from 59 K to 64.2 K in Sn-doped samples. The amounts of hysteresis losses above the TP in all doped samples were smaller than that of the Sn-free sample. Therefore, the effect of Sn doping suppressed the inter-granular critical current, J_{cm} , and the presence of weak links that coupled the superconducting grains.

Keyword: AC losses; BSCCO; Sn-doped; Superconductor