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Research paper

The effect of TlF_3 substitution on the weak links behaviour and AC susceptibility of $\text{Bi}_{1.8-x}\text{Tl}_x\text{Pb}_{0.35}\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_y\text{F}_{3x}$ superconductors

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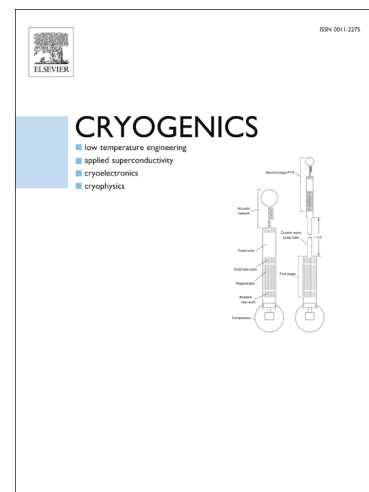
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Highlights

- The TlF_3 doped samples show a significant enhancement of the peak temperature (T_p) and broadening (FWHM).
- The doping with thallium fluoride of (Bi,Pb)-2223 phase improves the diamagnetic onset temperature (T_c).
- The effect of H_{AC} field and TlF_3 doping on the weak links behaviour is proved.
- We have successfully estimated the volume fraction of the grains f_g and extracted the experimental matrix susceptibility (χ_m'') by using the critical state model.
- Doping by TlF_3 enhanced f_g and the intergranular losses.
- χ_{max}'' and $\chi_{m,max}''$ values decreased with TlF_3 amount which attest of the improvement of the flux pinning ability into and between the grains.

Abstract

We have studied the thallium fluoride (TlF_3) doping and AC field dependence of the weak links behaviour and AC susceptibility of $\text{Bi}_{1.8-x}\text{Tl}_x\text{Pb}_{0.35}\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_y\text{F}_{3x}$ superconductors with range of $x = 0, 0.05, 0.10$ and 0.15 . The estimated value of the peak temperature (T_p) from the derivative of the resistivity curve ($d\rho/dT$) is increased with TlF_3 doping at 0 and 0.5 tesla and attest on both intragranular and weak links transition, while the full width at half maximum (FWHM) value is decreased. The susceptibility measurements $\chi'(\chi'')$ show that as the magnetic field increases the intra and intergranular AC loss peaks shift to lower temperature with broadening. It was found that the onset temperature of diamagnetism T_c is increased with TlF_3 doping. However, the

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