A Different Perspective on the AC Magnetic Susceptibility of $Bi_{1.7}(Pb_{0.3})Sr_2Ca_2Cu_3O_{10+x}$ Superconductor Modelled Using a Mechanism of Eddy Currents

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Complex magnetic susceptibility of polycrystalline $Bi_{1.7}(Pb_{0.3})Sr_2Ca_2Cu_3O_{10+x}$ at various AC magnetic field and frequencies was investigated. Experimental data indicated that for the magnitude of applied AC magnetic fields used, the magnetization remains proportional to the applied field. Without the assumption of flux penetration, the behaviour of the loss manifested in the imaginary component of the AC magnetic susceptibility was explained using a mechanism of eddy currents induced in the superconducting grains. The loss peak occurs due to a competition of two mechanisms, the eddy current induced due to the AC magnetic field and the shielding current appearing at the onset of superconductivity. A model based on the behaviour of the eddy current and the shielding current from the intragranular to the intergranular transition is discussed. The model is found to agree well with the experimental data and may be universally applicable to all granular superconductors at low AC field.