Evidences of vortex line recoupling in irradiated Bi-2212 from transport mesurements

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Abstract

Measurements of the c-axis magnetoresistance as a function of c- axis-oriented magnetic field, $\rho_c(H)$, I-V, and angular dependence measurements in single crystals of Bi-2212irradiated with heavy ions (1.2 GeV U^{238}) display distinct anomalies near fractional filling of the columnar defects created by the irradiation. The anomalous behavior extends over a limited range of temperatures 62-68K and in many crystals is manifested by a minimum in $\rho_c(H)$. The region of temperatutre-field where these anomalies appear coincides with that where Josephson plasma resonance, JPR, lines have been recently observed at two different magnetic field values by M. Kosugi *et al.*, Phys. Rev. Lett. (1997). This result has been interpreted as evidence for a "recoupling" of the pancake vortex liquid that is driven by the filling of columnar defect sites. Our present transport measurements directly show that a reduced pancake and phase slip mobility is associated with columnar defect filling in the vortex liquid state. Angular dependency of ρ_c scales with B_z in the wide range of the applied fields, *except* the region where enhanced correlation of the vortex liquid is predicted.In this region we observe a significant dependence of ρ_c on the in-plane component of the magnetic field, which was used to extract the phase-diference correlation function of the vortex liquid.