TEMPERATURE DEPENDENT AMRO IN $Tl_2Ba_2CuO_6$ (T_c ~ 15K)

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Introduction

We previously reported the observation of polar angular magnetoresistance oscillations (AMRO) in overdoped $Tl_2Ba_2CuO_6$ (Tl2201) (T_c ~ 15K) [1]. This year, we extended these measurements to elevated temperatures and incorporated, for the first time, basal-plane anisotropy into the analysis. This has allowed us to determine the temperature and momentum dependence of the in-plane mean-free-path and shed important new light on the origin of the anomalous transport in high-T_c cuprates [2].

Results and Discussion

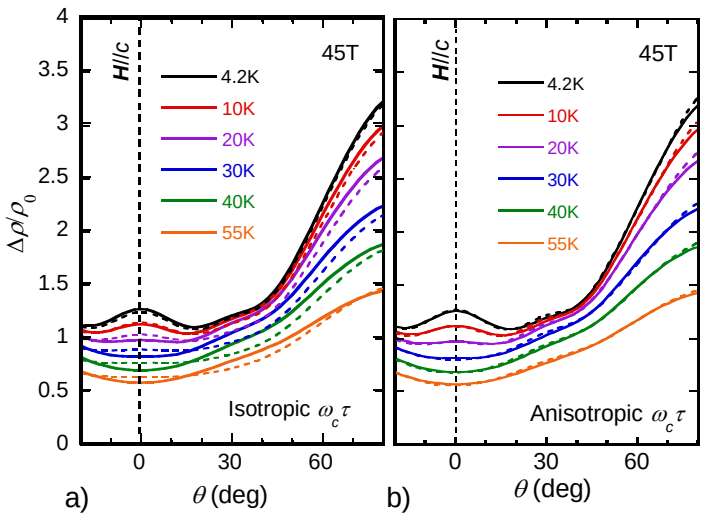

Figure 1a) T-dependence of the polar AMRO $\Delta\rho_\perp(\theta)/\rho_0$ in Tl2201 (T_c ~ 15K) at $\mu_0 H$ = 45T and ϕ = 35° relative to (π,0). Solid lines: $\Delta\rho_\perp(\theta)/\rho_0$ data. Dashed lines: least-squares fits with isotropic $\omega_c\tau$. **(b)** As (a) but now with an anisotropic $\omega_c\tau$.

Fig. 1a) shows AMRO data up to 55K for an overdoped Tl2201 single crystal (T_c ~ 15K) at $\mu_0 H$ = 45T. These temperatures are one order of magnitude higher than any previously recorded AMRO measurements. Remarkably, some of the polar AMRO features remain discernible up to 55K, in particular the kink around θ = 45°. The dashed lines in Fig. 1a) show least squares fits to the data assuming $\omega_c\tau$ remains isotropic up to 55K (keeping all other parameters fixed at their 4.2K values). These fits clearly deviate from the data as T is raised, suggesting either that the formula is inadequate or that additional parameters are required. One practical way to proceed is to introduce anisotropy in $\tau(\varphi)$. The best fits to such an anisotropic expression are shown in Fig. 1b). The quality of the fit is clearly much improved. Moreover, the subsequent fitting to the in-plane transport data is sufficiently good [2] that the introduction of additional parameter(s), e.g. to account for anisotropy in ω_c, appears to be redundant. The subsequent analysis uncovers a new scattering term whose origin is yet to be determined.

Acknowledgements

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References

[1] Hussey, N.E., *et al*., Nature, **425**, 814 (2003).
[2] Abdel-Jawad, M. *et al*. unpublished.