EVIDENCE FOR A TEMPERATURE AND FIELD DEPENDENCE OF THE ANISOTROPY OF SUPERCONDUCTING MgB_2

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9.7 cm

The anisotropy γ of superconducting state of high quality single-crystals of MgB_2 was determined using torque magnetometry. The anisotropy of the upper critical field decreases with increasing temperature from $\gamma \approx 6$ at 15 K to 2.8 at 35 K. Measurements of the reversible torque near T_c reveal an almost linear field dependence of the anisotropy of the coherence length and/or the penetration depth as well. The anisotropy increases nearly linearly from $\gamma \approx 2$ in zero field to 3.7 in 1 T. Our results imply a breakdown of standard anisotropic Ginzburg-Landau theory with a temperature and field independent effective mass anisotropy. The unusual temperature dependence of γ is a true bulk property and can be explained by non-local effects of anisotropic pairing and/or the wave-vector dependence of the effective mass tensor.

13.4 cm

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