

Evolution of Two-gap Superconductivity for $\text{Mg}(\text{B}_{1-x}\text{C}_x)_2$ Single Crystals

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The temperature and the angle dependence of the upper critical fields [$H_{c2}(T, \theta)$] of the two-gap superconductor $\text{Mg}(\text{B}_{1-x}\text{C}_x)_2$ single crystals ($x=0.06$ and 0.1) were obtained by resistivity measurements. These experimental results of $H_{c2}(T, \theta)$ were explained by the dirty-limit two-gap model. The obtained fitting parameters indicate that the impurity scattering in the π -band systematically increased. The upward curvature near T_c in the $H_{c2}(T)$ curve indicates that it is in the dirty σ regime. The upper critical field [$H_{c2}^{ab}(0)$] is enhanced but the anisotropy ratio [$\gamma_H(T)=H_{c2}^{ab}(T)/H_{c2}^c(T)$] decreases by C substitution. Interestingly, C doped MgB_2 shows a pronounced peak effect.

Keywords : upper critical field, anisotropy, diffusivity, C doping