Electron scattering dependence of dendritic magnetic instability in superconducting MgB$_2$ films

ZUXIN YE, QIANG LI, YUFENG HU, Brookhaven National Laboratory, A.V. POGREBNYAKOV, Y CUI, X.X. XI, J.M. REDWING, QI LI, Pennsylvania State University — We studied magnetic stability in both ultra-pure and carbon-doped MgB$_2$ films using magneto-optical imaging, transport and bulk magnetization measurements. In the carbon-doped MgB$_2$ film, dendritic flux-jumps were observed at low temperature as reported in previous experiments. However, a remarkably stable flux penetration was observed in the ultra-pure MgB$_2$ film, clearly showing the classic behavior of the critical state model. Such different behaviors indicate that the electron scattering ultimately controls the magnetic stability of MgB$_2$ films.

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