Measurement of $H_{c1}$ in MgB$_2$ thin films and multilayer structures by a microwave absorption technique

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— For superconducting RF applications, Gurevich suggested a route to enhance the vortex penetration field, $H_{c1}$, and thermal breakdown field by a multilayer structure consisting of alternating insulator and superconductor layers with thicknesses smaller than the penetration depth. We have measured $H_{c1}$ of MgB$_2$ thin films and multilayer structures by measuring the microwave absorption of the sample at 9.3 GHz in a TE102 rectangular cavity under an applied magnetic field. The magnetic fluxon penetration into the sample as the applied field is increased to greater than $H_{c1}$ leads to an increase in the microwave absorption. Preliminary results indicate an enhancement of $H_{c1}$ in the MgB$_2$ thin films from the bulk value, consistent with Gurevich’s thickness effect model, which is very promising for RF applications of MgB$_2$. 

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