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Enhancement of lower critical field in thin MgB_2 films and MgB_2/MgO multilayers TENG TAN, EVAN JOHNSON, NARENDRA ACHARYA, MICHAEL HAMBE, KE CHEN, Department of Physics, Temple University, ALEX KRICK, STEVEN MAY, Department of Materials Science and Engineering, Drexel University, XIAOXING XI, Department of Physics, Temple University — Magnesium diboride is a conventional superconductor with a high T_c of 39 K, a low residual resistivity of < 0.1 $\mu\Omega$cm (at 42 K), and higher thermodynamic critical field H_c values than Nb. These properties make MgB_2 a promising superconductor as an alternative to Nb for future SRF cavities. However, the lower critical field H_{c1} of MgB_2 is low, and vortex dissipation above H_{c1} can lead to degradation of the quality factor and low RF breakdown field. Here, we report an enhancement of H_{c1} in thin MgB_2 films and MgB_2/MgO multilayers. The value of H_{c1}(5K) is increased from 40 mT in a 300 nm-thick MgB_2 film to 180 mT when the MgB_2 layer thickness is 100 nm either in a single-layer film or in a MgB_2/MgO multilayer with a total MgB_2 layer thickness of 300 nm. Superconducting MgB_2 thin films have been coated *in-situ* on the inner wall of a SRF cavity using the hybrid physical chemical vapor deposition (HPCVD) technique. The characterization of the coating will be presented.

Teng Tan
Department of Physics, Temple University

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