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**$MgB_2$ thin films for SRF application** TENG TAN, MATTHAEUS WOLAK, NARENDRA ACHARYA, KE CHEN, XIAOXING XI, Department of Physics, Temple University — Superconducting RF (SRF) cavities are usually fabricated from bulk niobium (Nb), a material which is thoroughly studied and approaching its limits. Magnesium diboride ($MgB_2$) has a higher $T_c$ of 39 K, a lower residual resistivity of <0.1 $\mu\Omega$ cm (at 42 K), and a higher thermodynamic critical field $H_c$ value comparing with Nb. These properties imply that a $MgB_2$-coated SRF cavity would work at a higher temperature with a lower energy dissipation. 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 a low RF breakdown field. In this work, we report an enhancement of $H_{c1}$ in both c-axis oriented epitaxial and polycrystalline $MgB_2$ thin films. The value of $H_{c1}$ (5 K) was increased from 60 mT in a 300 nm-thick $MgB_2$ film to 180 mT when the $MgB_2$ layer thickness was 100 nm in both cases. The microwave properties of the $MgB_2$ films were characterized as well by using the dielectric resonator technique.

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