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High Upper Critical Field and Critical Current Density of Carbon-doped MgB_2 Films by HPCVD Using TMB WENQING DAI, KE CHEN, QI LI, Department of Physics, Pennsylvania State University, University Park, PA 16802, XIAOXING XI, Department of Physics, Department of Materials Science and Engineering, Pennsylvania State University, University Park, PA 16802 — Carbon-doping is effective to enhance upper critical field H_{c2} and critical current density J_c of MgB_2. Using Trimethylboron (TMB) as the doping source, we have successfully fabricated carbon-doped MgB_2 thin films by the Hybrid Physical-Chemical Vapor Deposition (HPCVD) method. Large temperature derivative $-dH_{c2}^{//ab}/dT$ values near T_c, as high as 8.3 T/K, have been achieved for heavily doped samples. These values are much higher than what have been reported before. With T_c over 30 K, $H_{c2}^{//ab}(0)$ values over 100 T can be expected for these samples. For lightly doped films, J_c values, larger than 10^5 A/cm^2 at 5 K under 9 T perpendicular field and 10^4 A/cm^2 at 20 K under 5 T perpendicular field, were obtained. The results demonstrate that carbon-doped MgB_2 films by HPCVD using TMB are promising for high field applications.

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