Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Upper critical field enhancements of TMB HPCVD magnesium diboride F. HUNTE, J. JAROSZYNSKI, A. GUREVICH, D.C. LARBALESTIER, Applied Superconductivity Center, NHMFL, Florida State University, Y. ZHU, P.M. VOYLES, University of Wisconsin, Madison, R.H. WILKE, X.X. XI, The Pennsylvania State University — The H_{c2} of four well textured carbon-doped MgB_2 films grown by HPCVD from tri-methyl boron (TMB) at flow rates from 2.5 to 10 sccm was measured in fields up to 45T. H_{c2} derived from low- current, four-point magnetoresistance clearly increases with increasing TMB flow rate. TMB appears to be a more uniform dopant than the $(C_6H_7)_2Mg$ used earlier. These earlier films exhibited $H_{c2}^{\parallel}(0)$ up to 70 T but also were imperfectly connected ($\rho(50\text{ K}) \sim 200 - 800\ \mu\Omega$cm) due to excess amorphous C-rich phases observed between the MgB_2 grains. In strong contrast, $\rho(50\text{ K})$ was only $10 - 20\ \mu\Omega$cm for the TMB films. When first measured, the linearly extrapolated $H_{c2}^{\parallel}(0)$ reached $\sim$40 T for the film with the highest TMB flow rate, but after about 3 months of aging, this value rose to $\sim$ 50 T. The angular dependence of H_{c2} for this sample was measured up to 45 T yielding $H_{c2}^{\parallel}(4.2\text{ K}) = 45.8$ T and showing the good Ginzburg-Landau scaling with an H_{c2} anisotropy of 2.88 at 4.2 K. These results are discussed in terms of the theory of dirty two-gap superconductors as a part of an in-depth study of the effect of ternary doping of magnesium diboride.

Frank Hunte
Applied Superconductivity Center, NHMFL, Florida State University

Date submitted: 03 Dec 2007 Electronic form version 1.4