Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Disorder in carbon-doped HPCVD MgB_2 thin films YE ZHU, P.M. VOYLES, Department of Materials Science and Engineering, University of Wisconsin, Madison, A.V. POGREBNYAKOV, X.X. XI, Department of Physics, Department of Materials Science and Engineering, and Materials Research Institute, Pennsylvania State University — Carbon-doped MgB_2 films prepared by hybrid physical-chemical vapor deposition have the highest H_{c2} ($\sim$70 T at 0 K for H parallel to *ab* plane) of all MgB_2 materials. We have characterized the nanoscale structure and chemistry of one such film by TEM and STEM. The C concentration in the $Mg(B_{1-x}C_x)_2$ grains from EELS is not dramatically higher than that of C-doped bulk MgB_2, so doping does not explain the high H_{c2}. Instead, the doped film has a variety of forms of structural disorder at length scales down to 5 nm, which may be sufficient to explain the H_{c2} of these films. These include MgB_2 domains with a 30 degree rotation about the *c*-axis, small angle rotations about *c*-axis, and a small tilt of the *c*-axis. There are also amorphous, C-rich regions between some MgB_2 domains. The amorphous phase comes from the oversupply of C during growth, which may also cause the other disorder by interrupting epitaxial film growth. This work is supported by the FRG on MgB_2, NSF DMR-0514592.

Ye Zhu

Date submitted: 16 Nov 2006 Electronic form version 1.4