Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Upper critical field study of MBE grown MgB_2 thin films J. JAROSZYNSKI, F. HUNTE, A. GUREVICH, D. C. LARBALESTIER, Applied Superconductivity Center, NHMFL, Tallahassee, Y. ZHU, P. M. VOYLES, University of Wisconsin, Madison, Y. SHEN, R. GANDIKOTA, R. SINGH, J. ROWELL, N. NEWMAN, Arizona State University, Tempe — "Normal" alloying of MgB_2 enhances the electron scattering, as does radiation damage. As a result, the upper critical field $H_{c2}^{\parallel}(0)$ parallel to the ab planes doubles from about 18 to 35 T. ASU has been growing films by non-equilibrium MBE methods and either intentionally doping with oxygen during growth, or by deposition at room temperature with subsequent annealing *ex situ* at rather low temperature: *e.g.* 350 °C for 36 hrs followed by 600 °C for 30 min. The resistive transitions of the films have been measured in fields up to 45 T at different temperatures. The measurements revealed strong enhancement of $H_{c2}^{\parallel}(0)$. In particular, the cold-deposited film remains superconducting at 45 T at 5 K, while extrapolation yields $H_{c2}^{\parallel}(0)$ higher than 65 T, almost as high as the best C-doped HPCVD films. At the same time, the film is strongly inhomogeneous, the resistivity is as high as 30 mΩcm, while the transitions are very broad, and the critical temperature is lowered to 24 K. However, dH_{c2}/dT at T_c reaches a record high value of 2.7 T/K. These observations open up another way to get exceptional H_{c2} values in MgB_2 films.

Jan Jaroszynski
Applied Superconductivity Center NHMFL

Date submitted: 27 Nov 2007 Electronic form version 1.4