Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

High quality MgB_2 thin films in clean and dirty limit realized via HPCVD[1] CHENGGANG ZHUANG, SHENG MENG, QINGRONG FENG, ZIZHAO GAN, PKU P.R.C, HUAN YANG, YING JIA, HAIHU WEN, CAS P.R.C, XIAOXING XI, PSU USA — Pure and carbon-doped MgB_2 thin films are fabricated using hybrid physical-chemical vapor deposition. Excellent properties are obtained in the pure samples, including T_c ~41.4K, ρg(42K)~0.3$\mu\Omega$ cm, which indicates that films are in the clean limit. Ultrahigh critical current density, up to 1x10^{8}A/cm^2 at 5K and zero fields, approaching the theoretical deparing current of MgB_2, was observed in a 150nm-wide microbridge, in agreement with the results derived using a Bean Model from the magnetization measurements. Large normal state magnetoresistance before the transition, about 40% at 7T, and absence of flux jump at low temperature and low field regions in the magnetization curves strongly support that the film is very clean. To enhance upper critical field and flux pinning, carbon doping is employed and realized in a dual-heater HPCVD setup from the thermal decomposition of CH_4. $\mu_0 H_{c2}(0)$~54T, J_c(5K,6T)~3x10^{5}A/cm^2, as well as $T_c(0)$~34K and ρg(42K)~47$\mu\Omega$cm are achieved in the carbon-doped films. By controlling the carbon concentration, MgB_2 films in dirty limit can be prepared.

[1]This work was supported by the NSFC No. 50572001 and the 973 project: 2006CD601004.

Chenggang Zhuang
PKU P.R.C

Date submitted: 23 Nov 2007 Electronic form version 1.4