Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Fabrication and characterization of MgB_2/ thermal oxide barrier /Pb Josephson tunnel junctions YI CUI, KE CHEN, QI LI, XIAOXING XI, Department of Physics, The Pennsylvania State University, JOHN M. ROWELL, Arizona State University — Cross-bridge Josephson tunnel junctions were fabricated, using MgB_2 films grown by hybrid physical-chemical vapor deposition (HPCVD) and barriers made by thermal oxidation at different temperatures. The junctions showed clear Josephson tunneling characteristics with high supercurrents, high I_cR_N products (I_cR_N products $\sim$1.8 mV at 4.2 K), and small subgap current leakage. The external DC magnetic field dependence was also measured and showed clear Fraunhofer pattern. The properties of the thermal oxide barrier depend sensitively on the oxidation temperature. The potential height and barrier thickness of 0.7 eV and 1.8 nm, respectively, were inferred from conductance measurements at high bias voltage. Two superconducting gaps of 2.0 meV and 7.5 meV for MgB_2 were observed from these sandwich-type tunnel junctions. These results suggest the potential of using MgB_2 thermal oxide layers as a barrier for practical Josephson tunnel junction fabrication. This work is supported by ONR and NSF.

Yi Cui
Department of Physics, The Pennsylvania State University

Date submitted: 30 Nov 2005 Electronic form version 1.4