Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Magnetoresistance in Boron Carbide junctions[1] ELLEN DAY, A. SOKOLOV, A. BARUTH, B.W. ROBERTSON, S. ADENWALLA, University of Nebraska-Lincoln — The properties of thin insulator layers are crucial to the performance of magnetic tunnel junctions. Commercial requirements are a device with a high tunnel magnetoresistance (TMR) with low cost and high stability. At present the vast majority of barriers are made from amorphous Al_2O_3 and crystalline MgO. The TMR value depends not only on the spin-dependent electronic structure of the electrodes, but on the metal-insulator interface. Oxide-type barriers may suffer from local vacancies and other type of defects, resulting in oxygen diffusion, making the TMR value unstable with time. We present TMR results obtained on a non-oxide barrier, boron carbide ($B_{10}C_2$) for applications in magnetic tunnel junctions. This low Zinorganic material can be grown by plasma enhanced chemical vapor deposition (PECVD) without pinholes in the ultra thin film regime. PECVD grown boron carbide is an excellent dielectric with resistivities in the range of 10^7 ohm-cm, with a band gap that can be adjusted from 0.7 eV to 1.9 eV by altering the boron to carbon ratio and to band gap values well above 2.7 eV by adding phosphorus. This creates a unique opportunity for experimental study of a broad spectrum of phenomena, related to the dielectric properties of the barrier.

[1]Supported by the NSF through the MRSEC, DMR and CHE depts.

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Date submitted: 03 Dec 2006 Electronic form version 1.4