Spin dependent transport in FeCo|MgBO|FeCo magnetic tunnel junctions: Can boron in the oxide region be a good thing? DEREK STEWART, Cornell Nanoscale Facility, Cornell University — Recent experimental studies on FeCoB/MgO/FeCoB tunnel junctions have shown that boron can diffuse into the oxide region during rf-sputtering and result in the formation of crystalline MgBO regions[1,2]. These tunnel junctions still provide high tunneling magnetoresistance values as well as very low RA products[3]. Using a plane wave-pseudopotential density functional approach, I have examined potential Mg(B) oxides such as Mg$_2$B$_2$O$_5$ (both monoclinic and triclinic) as well at kotoite (Mg$_3$B$_2$O$_6$). Total energy calculations indicate that these oxides should be more stable than the formation of separate regions of MgO and B$_2$O$_3$. Kotoite (Mg$_3$B$_2$O$_6$) also has a boron concentration close to that found in the experimentally grown MgBO regions. In addition, kotoite provides a good lattice match with MgO and could act to template neighboring FeCo into crystalline bcc layers during annealing. This evidence suggests that kotoite is formed during the deposition process. I will also discuss the complex band structure of kotoite (Mg$_3$B$_2$O$_6$) and examine how this will also affect spin dependent transport from the FeCo leads. [1] J. Y. Bae et al., J. Appl. Phys. 99 08T316 (2006) [2] J. C. Read et al., Appl. Phys. Lett. 90 132503 (2007) [3] J. C. Read personal communication

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Date submitted: 20 Nov 2008

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