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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 $Mg_2B_2O_5$ (both monoclinic and triclinic) as well at kotoite ($Mg_3B_2O_6$). Total energy calculations indicate that these oxides should be more stable than the formation of separate regions of MgO and B_2O_3. Kotoite ($Mg_3B_2O_6$) 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 ($Mg_3B_2O_6$) 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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