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Voltage-controlled magnetic tunnel junctions with Gd_2O_3 barriers TY NEWHOUSE-ILLIGE, CHARLES STANFORD, MATTHEW GAMBLE, CHONG BI, HAMID ALMASI, WEIGANG WANG, Univ of Arizona — It is of great importance to investigate magnetic tunnel junction (MTJ) with high-k barriers, with the premise that a large voltage-controlled magnetic anisotropy (VCMA) can be achieved due to the increased charge transfer effect. Gd_2O_3 has a dielectric constant of 22, which is substantially larger than that of MgO (~ 9). It is critical to achieve crystalline barrier with cubic phase in order to obtain symmetry-conserved tunneling as in MgO-based MTJs. We have demonstrated that Cubic Gd2O3 can be grown on amorphous CoFeB by reactive sputtering under proper conditions. In exchanged-biased MTJs with in-plane anisotropy, tunneling magnetoresistance (TMR) up to 12% has been obtained. The sharp switching at near zero field and exchange-bias field higher than 800 Oe indicate the magnetic properties of the CoFeB in these junctions are nearly as good as in MgO-based MTJs. MTJs with interfacial perpendicular magnetic anisotropy (PMA) has been created with TMR $\sim 10\%$. A very interesting VCMA effect in these Gd_2O_3-based MTJs has been observed and will be discussed. This work was supported in part by NSF (ECCS-1310338) and by C-SPIN, one of six centers of STARnet, a Semiconductor Research Corporation program, sponsored by MARCO and DARPA.

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