

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Impurity induced enhancement of perpendicular magnetic anisotropy and spin polarization in Fe/MgO magnetic tunnel junctions ALI HALLAL, BERNARD DIENY, MAIRBEK CHSHIEV, Spintec, CEA/CNRS/UJF-Grenoble 1/G-INP, INAC, Grenoble, France — Magnetic tunnel junctions (MTJ) with perpendicular magnetic anisotropy (PMA) provide better thermal stability and lower switching current compared to in-plane MTJs [1]. In this context, Fe/MgO MTJs have been extensively studied where PMA values of 1-2 mJ/m² have been reported [1-3]. To maximize the effective PMA in Fe/MgO we propose to lower the saturation magnetization of the magnetic electrodes by introducing non-magnetic impurities X=Cr,V in Fe to maintain the PMA for thicker FeX alloys. Using first-principles calculations we investigated the effect of impurities on the magnetic anisotropy in Fe(001)/MgO. To avoid the depolarization of the interfacial Fe layer we calculated the effective PMA as function of impurities concentration by including impurities only in the bulk of Fe. The effective PMA is found to increase as a function of Cr and V concentration with V being more efficient compared to Cr impurities [4].

[1] S. Ikeda et al, Nature Mater., 9 (2010) 271.

[2] C.-H. Lambert et al, Appl. Phys. Lett. 102, 122410 (2013)

[3] H. X. Yang et al, Phys.Rev. B 84, 054401 (2011); A. Hallal et al, accepted in PRB.

[4] A. Hallal et al, in prep.

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Date submitted: 14 Nov 2013

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