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Positive exchange bias in epitaxial permalloy/MgO integrated with Si (100) SRINIVASA RAO SINGAMANENI, North Carolina State University, J.T PRATER, Army Research Office, FAN WU, S. NORI, North Carolina State University, D. KUMAR, North Carolina A&T University, L. YUE, S.-H. LIOU, University of Nebraska, J. NARAYAN, North Carolina State University — Thorough understanding of epitaxial $Ni_{82.5}Fe_{17.5}$ (permalloy, Py) magnetic properties when integrated with the technologically important substrate Si (100) is critical for CMOS-based magnetic devices. Interestingly, we find[1,2] that the magnetic features of Py films in early stages of island coalescence are markedly different from the films formed initially and after extended deposition times. Magnetic data on these transitional films show highly anisotropic magnetic behavior with an easy magnetization axis lying in the plane of the film. Importantly, when this sample is zero-field cooled, a positive exchange bias and vertical loop shift are observed, unusual for a soft ferromagnet like Py. Repeated field cycling and hysteresis loops up to the fields of 7T produced reproducible hysteresis loops indicating the existence of strongly pinned spin configurations, consistent with the magnetic force microscopy data. We believe that the anomalous magnetic behavior of such Py films may be explained by considering the highly irregular morphology that develops at intermediate growth times that are possibly also undergoing a transition from Bloch to Neel domain wall structures as a function of growth time.

[1]S.S.Rao *et al,* Curr. Opin. Solid State Mater. Sci. (2013), http://dx.doi.org/10.1016/j.cossms.2013.07.004;
[2]S.S.Rao *et al*, under review (2013).

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