Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Origin of Giant Saturation Magnetization in $Fe_{16}N_2$ thin film JIAN-PING WANG, NIAN JI, XIAOQI LIU, YUNHAO XU, Center for Micromagnetics and Information Technologies, University of Minnesota, C. SANCHEZ-HANKE, NSLS, Brookhaven National Laboratory — Can localized 3d electron exist in strong ferromagnetic metal because of some unusual correlation effect? This question is related to the controversy on whether α"- $Fe_{16}N_2$ has giant saturation magnetization which has been debated for decades since its first observation[1,2]. Here we report the synthesis of α"- $Fe_{16}N_2$ thin films. The highest moment is obtained to be $3.0\mu_B$/Fe. XMCD experiment is systematically performed on a series of iron nitrides samples. Among all the iron nitrides phases, it is found that there exist highly localized 3d electrons only in chemically disordered Fe_8N and ordered $F_{16}N_2$ phases[3]. This discovery hints at the origin of the giant magnetic moment is correlated with the 3d electron localization in such system. First principle calculation (LDA+U) further verifies that the d electron localization is the key element to rationalize the high moment formation in iron nitrides system[4]. We also provide a speculative outlook on the giant saturation magnetization formation based on "cluster + atom" concept. 1.Kim, T.K. and Takahashi. M, Appl. Phys. Lett., 20, 492 (1972) 2.Sugita, Y., et al., J. Appl. Phys. 76, 6637 (1994) 3.Liu, X. Q. et al., arxiv: 0909.4480 (2009) 4.Ji, N. et al., arxiv: 0909.4478 (2009)

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Date submitted: 15 Dec 2009 Electronic form version 1.4