

Effect of NiO spin switching on the Fe film magnetic anisotropy in epitaxially grown Fe/NiO/Ag(001) and Fe/NiO/MgO(001) systems

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Single crystalline Fe/NiO bilayers were epitaxially grown on Ag(001) and on MgO(001), and investigated by Low Energy Electron Diffraction (LEED), Magneto-Optic Kerr Effect (MOKE), and X-ray Magnetic Linear Dichorism (XMLD). We find that while the Fe film has an in-plane magnetization in both Fe/NiO/Ag(001) and Fe/NiO/MgO(001) systems, the NiO spins switch from out-of-plane direction in Fe/NiO/MgO(001) to in-plane direction in Fe/NiO/Ag(001). These two different NiO spin orientations generate remarkable different effects that the NiO induced magnetic anisotropy in the Fe film is much greater in Fe/NiO/Ag(001) than in Fe/NiO/MgO(001). XMLD measurement shows that the much greater magnetic anisotropy in Fe/NiO/Ag(001) is due to a 90°-coupling between the in-plane NiO spins and the in-plane Fe spins which causes a switching of the NiO spins during the Fe magnetization reversal.