# Abstract

The aim of this work was to use strain to manipulate magnetic properties in antiferromagnetic layers. It was shown that in Fe/NiO/Cr($d_{Cr}$)/MgO(001) system a change in Cr buffer thickness leads to a continuous spin reorientation transition in NiO. The observed effect originates from epitaxial strain exerted on NiO layer by Cr buffer. Whereas the tensile strain exerted by MgO substrate on NiO layer stabilizes out-of-plane component of NiO spins, the NiO spins prefer an in-plane orientation under compressive strain exerted by Cr buffer. Additionally, for ultrathin NiO films in Fe/NiO($d_{NiO}$)/Cr/MgO(001) system, the analysis of in-plane magnetic anisotropy of antiferromagnet revealed an orthogonal coupling between NiO and Fe spins. The orthogonal coupling dissipated with an increase in NiO thickness.

It was found that the insertion of an MgO layer between NiO and Cr buffer in (Fe)/NiO/MgO($d_{MgO}$)/Cr/MgO(001) system strongly influences the magnetic state of NiO. Together with an increase in MgO interlayer thickness, a rotation of the NiO spins towards the out-of-plane direction occurs. The reorientation can be understood in terms of epitaxial strain exerted by MgO interlayer on NiO film. The combination of strain engineering and ferromagnetic/antiferromagnetic exchange coupling was used to create a multidomain state in the NiO layer. Furthermore, it was demonstrated that the repopulation of NiO domains could be induced by modifying the Fe layers thickness.

The piezoelectric strain was used to modulate the magnetic state of Fe/CoO bilayers grown on PMN-PT(001) piezoelectric substrate. It was shown that the voltage-induced changes in coercivity of Fe/CoO bilayers are related to the piezoelectric strain-induced modification of magnetic state of CoO.

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