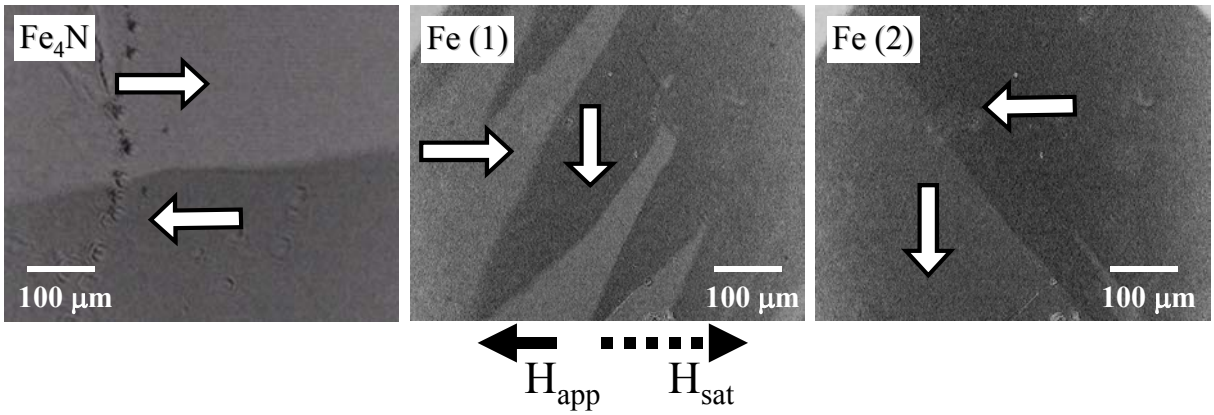
# MAGNETIZATION REVERSAL PROCESSES IN EPITAXIAL γ'-$Fe_4N$ THIN FILMS ON (100) MgO

M.S. Martín-González, S. Melle, J.M. García, J.L. Costa-Krämer, A. Cebollada, F. Briones
*Instituto de Microelectrónica de Madrid, IMM (CNM-CSIC)*
*C/ Isaac Newton, 8 (PTM) 28760 - Tres Cantos. Madrid (SPAIN).*

D.M. Borsa and D.O. Boerma
*Nuclear Solid State Physics, Materials Science Centre, University of Groningen,*
*Nijenborgh 4, 9747 AG, Groningen, The Netherlands*

There is an ongoing interest in the growth of epitaxial magnetic films on top of an insulator for applications such as magnetic sensors, non-volatile magnetic memories (MRAMs), or magnetic storage media. In the present study we compare the magnetization reversal processes under in-plane magnetic fields of single-layers of epitaxial $Fe_4N$ and Fe on (100) MgO by combining transversal Kerr-effect hysteresis loops and Kerr microscopy. The 400 Å $Fe_4N$ film was grown by using a mixture of $N_2/H_2$ into a molecular beam epitaxy chamber with a base pressure of $10^{-10}$ mbar range.[1] The deposition of a 175 Å Fe/MgO film was performed in a triode sputtering system with a base pressure in the low $10^{-9}$ mbar range.

According with the measurements, the magnetization switching proceeds by an initial rotation of the magnetization vector and by the sweeping of 90º and 180º domain walls depending on the applied field orientation and on the film anisotropy.[2] Whereas the $Fe_4N$ film exhibits the four-fold symmetric anisotropy, the iron film has a weak uniaxial anisotropy superimposed and such additional contribution induces different switching behaviour[3]. For instance, in the case of $Fe_4N$ when the field is applied along the easy axis, the magnetization reversal takes place by the sweeping of 180º walls (see $Fe_4N$ Figure, the white arrows indicate the magnetization direction). However, for the iron film, two different easy axes with distinct switching mechanisms can be distinguished: the so-called easy-easy axis and easy-hard axis (i.e. "easy" with respect to the cubic anisotropy and "easy" or "hard" according to the uniaxial anisotropy, respectively). For an applied field along the easy-easy axis the reversal process exhibits spike domains, whilst for an applied field along the easy-hard axis the switching takes place in two steps, each one with the sweeping of 90º walls (see Figures Fe(1) and Fe(2)).




## REFERENCES

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