Title

Spins and Twins: Correlation between Crystallographic and Magnetic Domains at Co/NiO(001) Interfaces

Authors

Ohldag, H.
Laan, G. van der
Arenholz, E.

Publication Date

2009-11-01

Spins and Twins: Correlation between Crystallographic and Magnetic Domains at Co/NiO(001) Interfaces

H. Ohldag[1]; G. van der Laan[3]; E. Arenholz[2]

1. SSRL, Stanford University, Menlo Park, CA, USA.
2. Advanced Light Source, LBNL, Berkeley, CA, USA.
3. Diamond Light Source, Chilton, United Kingdom.

Elucidating the mechanisms behind the magnetic ordering and coupling at interfaces is crucial for the understanding of complex magnetic systems, such as nanomagnet assemblies and magnetic heterostructures. One particular area of interest concerns antiferromagnetic (AF) surfaces and their interfaces to ferromagnetic (FM) layers. Since AF systems are not sensitive to external fields they can induce an uniaxial anisotropy in an FM layer through AF/FM exchange coupling. Using soft x-ray spectromicroscopy we show that NiO(001) exhibits a crystallographic and magnetic domain structure near the surface identical to that of the bulk. Upon Co deposition a perpendicular coupling between the Ni and Co moments is observed that persists even after formation of uncompensated Ni spins at the interface through annealing. The chemical composition at the interface alters its crystallographic structure and leads to a reorientation of the Ni moments from the <112> to the <110> direction. We show that this reorientation is driven by changes in the magnetocrystalline anisotropy rather than exchange coupling mediated by residual uncompensated spins.

Supported by the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

H. Ohldag, G. v. d. Laan and E. Arenholz Phys. Rev. B **79**, 052403 (2009)