Symposium H
Nanoscale tailoring of defect structures for optimized functional & multifunctional oxide films

EBSD ANALYSIS OF THE GROWTH OF (0 0 1) MAGNETITE THIN FILMS ON MgO SUBSTRATES, A KOBLISCHKA-VENEVA, Institute of Functional Materials, P. O. Box 151150, D-66041 Saarbrücken, Germany, M. R. KOBLISCHKA, U. HARTMANN, Institute of Experimental Physics, P. O. Box 151150, D-66041 Saarbrücken, Germany, F. MÜCKLICH, Institute of Functional Materials, P. O. Box 151150, D-66041 Saarbrücken, Germany, Y. ZHOU, S. MURPHY, I. V. SHVETS, SFI Nanoscience Laboratory, Trinity College, Dublin, Dublin 2, Ireland.

Magnetite (Fe_3O_4) thin films grown on (0 0 1) MgO substrates are analyzed by means of electron backscatter diffraction (EBSD) analysis. The EBSD technique enables the crystallographic orientation of individual grains to be determined with a high spatial resolution up to 20 nm even on ceramic samples. The magnetite films are fully strained due to the lattice mismatch of MgO and Fe_3O_4. Upon annealing in air, the magnetic properties of the magnetite thin films were found to change considerably. Using the EBSD analysis, we find that most of the misorientation boundaries existing in the as-grown films are vanishing after the annealing step and the remaining misoriented grains form small islands with a size of about 100 nm. These islands are caused by MgO particles as detected by EBSD. The size and distribution of these islands correspond well to the observations of antiferromagnetic pinning centers within the magnetic domain structures carried out by magnetic force microscopy (MFM) on the same samples.

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