# Magnetic anisotropy modifications of single crystalline rippled Fe

**M. O. Liedke[a], M. Körner[a], K. Lenz[a], A. Shalimov[a], T. Strache[a], M. Ranjan[a], S. Facsko[a], J. McCord[a] and J. Fassbender[a]**

[a]Helmholz-Zentrum Dresden-Rossendorf, Institut für Ionenstrahlphysik und Materialforschung, Bautzner Landstraße 400, 01328 Dresden, Germany

9.7 cm

Ion erosion as a tool for nanostructuring has proven its versatility with respect to surface morphology modifications. Ion irradiation parameters, e.g. ion energy, fluence, incident angle, and sample temperature, can be varied in order to assemble self-organized periodically ordered arrays of nano-dots and ripples. Particularly, nanopatterning of magnetic materials is meaningful because not only the surface morphology is affected, but the overall magnetic properties are accordingly modified. Here we present a novel bottom-up method of magnetic film patterning, where ordered periodic MgO ripple surfaces with a wavelength on the nanometer scale, ion sculptured along a few arbitrary in-plane orientations and outstandingly fully crystalline upon ion irradiation, are coated by a magnetic Fe layer. Due to a cubic symmetry of Fe an in-plane fourfold magnetic anisotropy is induced and in addition, an uniaxial magnetic anisotropy arises due to the surface morphology. The uniaxial magnetic anisotropy orientation and strength is controlled by an arbitrarily chosen irradiation direction with respect to the sample plane and the ripple wavelength is set by the ion energy, respectively. Thus an ensemble of twofold and fourfold anisotropy is created and analyzed by ferromagnetic resonance, magneto-optic Kerr effect, and X-ray diffraction techniques. Theoretical analysis reveals both the anisotropy fields and their directions that are in agreement with the experiment. This work is supported by DFG FA314/6-1.

13.4 cm

**Subject category :**

5. Nano-structure, Surfaces, and Interfaces

**Presentation mode :**
oral

**Corresponding author :**
M. O. Liedke

**Address for correspondence :**
Helmholz-Zentrum Dresden-Rossendorf, Bautzner Landstraße 400, 01328 Dresden, Germany

**Email address :**
m.liedke@hzdr.de