

Magnetic domain structure of micro-patterned PtMn/CoFe exchange bias bilayers

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Using magnetron sputter deposition a number of glass/Ta 70 Å/PtMn 200 Å/CoFe 40 Å/Ta 40 Å samples with large exchange bias field were prepared for magnetic patterning investigations. By means of optical lithography and physical etching several patterns with decreasing lateral sizes of either the elements or the spacing between the elements were prepared. The largest square is $50 \times 50 \mu\text{m}^2$ and the smallest only $1 \mu\text{m}^2$. The separating lines range from $10 \mu\text{m}$ to $2 \mu\text{m}$ width. The magnetic characterization of the samples was done by VSM and MOKE. Kerr microscopy and MFM investigations in an applied magnetic field have been performed in order to get a deeper understanding of the domain pattern. All images show a monodomain magnetization state in zero magnetic field. The shape of the structure itself does not influence the magnetization direction. The shape anisotropy contribution is thus smaller than the unidirectional anisotropy given by the exchange bias. In addition 5 keV He⁺ ion irradiation was used to decrease exchange bias field value and thereby modify the ratio between unidirectional and shape anisotropy. The magnetic domain structure is investigated as a function of this ratio.

9.7 cm

13.4 cm

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