Ultrathin cobalt domain structure changes induced by overlayer structure

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The domain structures images of ultrathin cobalt films in the structure Al_2O_3\ X(20nm)\Au(20 nm)\Co(d nm thick layer or wedge)\X (d_X nm thick layer or wedge perpendicular to Co wedge axis)\Au(8nm) where X is vanadium or molybdenum are presented. Such double wedge structures were prepared in order to determine the d, and d_X ranges for which easy magnetization axis is perpendicular to sample plane. The domain structure (**DS**) study was performed by an optical polarizing microscope with CCD camera. Images of DS were registered during different stages of magnetization reversal induced by magnetic field pulses applied perpendicularly to sample plane with increasing pulses number (time dependences) or amplitude. Special software in LabView® was developed for both domain images acquisition and processing. Domain structures were studied as a function of thickness d and d_X. Spin reorientation transition (which was discussed theoretically in [1]) thickness ranges of d and d_X were determined. Subsequently the flat samples with such thickness d and d_X were grown to study the magnetization reversal state close to the reorientation phase. To analyze observed domain structures the topology properties of magnetic images was studied and three basic objects types: dendrites body, holes and fiords were chosen as parameters describing DS. We studied in particular: characteristic dendrite width; ratio between area of gulfs and holes to the total area; "brancheness" and curliness. Preference of domain wall orientation is observed in ultrathin Co covered by Mo and not for V, (see Fig.1c).

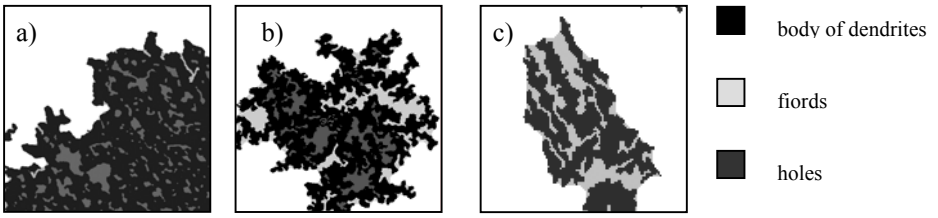

Fig.1 Different domain structure types for Co-films. X overlayer thickness induced changes of domain structure: a) d_V =0.06nm, d_{Co}=1.2nm; (image size 86x86μm), b) d_V =0nm d_{Co}=1.2nm (image size 86x86μm), c) preference of domain wall (image size 20x20μm) orientation in Co d_{Co}=1.2nm covered by Mo d_{Mo} = 1.2nm.

[1] M. Kisielewski *et al*. Phys. Rev. B **69** (2004) 184419.

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