QE04

DirectOobservation of Saw-Tooth Typed Domain Wall Jumps in Epitaxial Ferromagnetic MnAs film on GaAs(001)

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Epitaxial MnAs film on GaAs substrate is one of the promising systems for spintronic application in spin-injection devices because it has ferromagnetic properties with well-ordered interfaces at room temperature [1]. Due toits novel magnetic properties, the magnetization reversal behaviour in this system has been of considerable interest in the fundamental understanding of domain dynamics as well as in the application to spin-injection devices [2]. We present the direct observation of saw-tooth typed domain wall jumps in epitaxial ferromagnetic MnAs film on GaAs(001) substrate under a constant applied field. For this study, time-resolved magnetic domain-evolution patterns were directly observed on the sample areas with the size of $80 \times 64\ \mu m^2$ using a magneto-optical Kerr effect microscope. In Fig. 1, one can vividly see that the domain evolution patterns exhibit a sequence of saw-tooth typed domain wall jumps. Also, the saw-tooth typed domain wall jumps are found to appear on the sample area where the strong line defect existed. From analytical explanation, it is found that the saw-tooth domain wall structure is determined by the relative competition between the domain wall energy and the dipolar interaction energy within the sample.

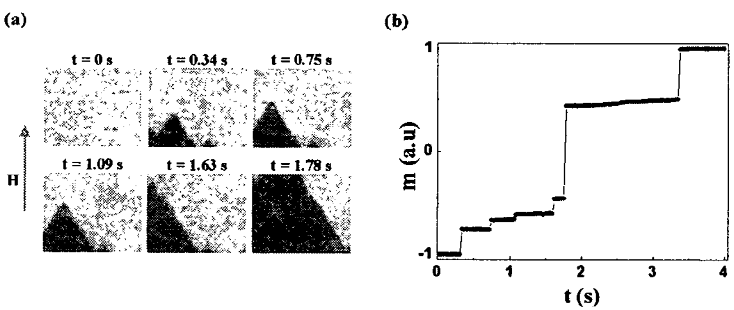

Fig. 1. Real-time domain evolution patterns and the corresponding magnetization reversal curve of the 50 nm-thick MnAs film, where the observed area is $80 \times 64\ \mu m^2$.

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QE05

Investigation of Magnetization Reversal in Chains of Permalloy Ellipses Via Magnetoresistance Measurement and Magnetic Force Microscope

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Single elliptical permalloy elements and chained elements were fabricated by standard electron beam lithography through a lift-off process. Magnetoresistacne measurements and magnetic force microscopy were utilized to investigate the switching field and the reversal mechanism, respectively. The length of elements plays an important role in the switching fields, in which the switching field is higher as the particle lengthis increased. When two ellipses were connected to a longer element, the switching field goes higher. In three chained ellipses, a wavelike domain configuration nucleated during magnetization reversal and contributed to a decrease of switching field associated with this kind of noncoherent reversal processes, which is in the opposite trend observed in the case of two chained ellipses.

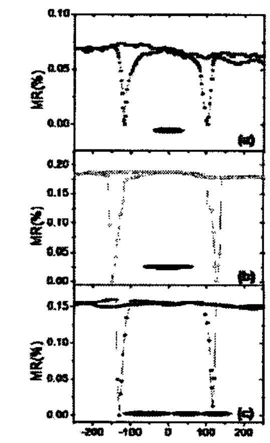

Fig. 1. MR curves of permalloy ellipses and ellipse chain with film thickness of 38 nm. The dimension are (a) long/short axis of 6/1 μm, (b) long/short axis of 10/1 μm, (c) the chain of two 6/1ellipses and one 10/1 ellipse with overlap of 300 nm at etch joint.

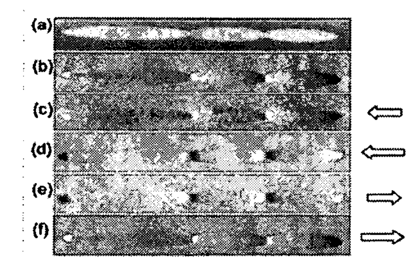

Fig. 2. (a) Atomic force microscopy image of the chain with two 6/1ellipses and one 10/1 ellipse. (b)-(f) MFM images illustrate a magnetization reversal with initial saturation to the right. (b) remanent state (c) -110 Oe, (d) -170 Oe, (e) 110 Oe, (f) 170 Oe.

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