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Effect of growth condition on magnetic domain structure and relaxation in Magnetic Antidot Lattice arrays

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Magnetic antidot lattice (MAL) arrays are periodic defects in continuous thin films and hence their magnetization reversal is significantly different in comparison to the parent film [1]. MALs are receiving immense research interest due to their potential advantages, such as lack of superparamagnetic limit [2] to the bit size and being promising candidates as magnonic crystals for the study of spin waves. Triangular MAL arrays with the structure of Al_2O_3 (2 nm)/Co (10 nm)/Al_2O_3 (2 nm) were prepared on photolithography patterned Si (100) substrates in a UHV chamber with 0 and 20 rpm substrate rotation. Surface topography studied by Atomic Force Microscopy (AFM) depicted that the growth mechanism of the grains change from chain like formation to island structures due to the substrate rotation [3]. Study of magnetization reversal via magneto optic Kerr effect (MOKE) based microscopy revealed reduction of uniaxial anisotropy and increase in domain size with substrate rotation. The relaxation measured under constant magnetic field becomes faster with rotation of substrate during deposition. The nature of relaxation for the samples are well described either by a slow double exponential at low applied field or Fatuzzo-Labrune [4] like fast single exponential behavior with increase in applied magnetic field [3, 5].

The exchange spring magnets with combination of hard and soft magnetic layers have been investigated intensely over last two decades due to its applications in magnetic devices, thermally assisted magnetic recording, permanent magnets etc. [6]. In the second part of my talk I will show our recent results on Co (soft) and CoFeB (hard) bilayer thin films and antidots [7].

References:

1. R. P. Cowburn *et al., Appl. Phys. Lett*. **70**, 2309 (1997), **2.** S. Bedanta *et al., J. Phys. D: Appl. Phys*. **42**, 013001 (2009), **3.** S. Mallick *et al., J. Appl. Phys*. **118**, 083904 (2015), **4.** F. Fatuzzo, *Phys. Rev*. **127**, 1999 (1962), M. Labrune *et al., J. Magn. Magn. Mat*. **80**, 211 (1989), **5.** S. Mallick *et al., J. Magn. Magn. Mat.* **382**, 158 (2015), **6.** D. Chumakov *et al*, *Phys. Rev. B* **66**, 134409 (2002), **7.** S. Mallick *et al.* (*unpublished*)

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