www.elsevier.com/locate/jmmm

Study of magnetization reversal processes in a thin Co film

N Chowdhury, S Bedanta, G.S Babu

PII: S0304-8853(13)00091-7
DOI: http://dx.doi.org/10.1016/j.jmmm.2013.02.009
Reference: MAGMA58090

To appear in: *Journal of Magnetism and Magnetic Materials*

Received date: 26 September 2012
Revised date: 14 January 2013

Cite this article as: N Chowdhury, S Bedanta and G.S Babu, Study of magnetization reversal processes in a thin Co film, *Journal of Magnetism and Magnetic Materials,* http://dx.doi.org/10.1016/j.jmmm.2013.02.009

Study of magnetization reversal processes in a thin Co film

N Chowdhury[1], S Bedanta[1,a)] and G S Babu[1]

[1]School of Physical Sciences, National Institute of Science Education and Research (NISER),

IOP Campus, Bhubaneswar-751005, India

[a]Corresponding author: sbedanta@niser.ac.in

PACS: 75.60.-d, 75.60.Jk, 75.70.Ak, 75.60.Ch

Abstract. The magnetization reversal has been studied both along the easy- and hard- axes for an in plane magnetized thin Cobalt film using magneto-optical Kerr effect (MOKE) microscope. We observe that magnetization reversal is governed by domain wall motion accompanied by nucleation when measured along the easy axis. However coherent rotation is observed during magnetization reversal when measured along the hard axis. The relaxation of magnetization in constant dc magnetic field measured along the easy axis show exponential behaviour which according to Fatuzzo – Labrune model indicates domain nucleated dominant process. Domain wall velocity plotted as a function of constant dc magnetic field shows creep and slide regime from which the depinning transition was extracted.

1. Introduction:

Magnetic thin films have been a subject of intense research for both physicists and engineers in last few decades. From a technological point of view, magnetic ultrathin and thin films have promising potential for use in high-density data storage, magnetic sensing and magnetoelectronic applications [1, 2]. However apart from applications, magnetic thin films are excellent system for studying many fundamental physics such as magnetic domain and domain wall dynamics, inter-layer coupling etc. Magnetization reversal in such thin and ultrathin films has been vividly studied for both above mentioned applications as well as to understand the phenomena of magnetic domains [1, 2].

Magnetization reversal is the process in which the magnetization direction of the film is reversed by applying an external magnetic field or current. In magnetic thin films the anisotropy behaviour is determined by various parameters such as external applied field during deposition, shadow deposition, substrate induced epitaxy etc. In uniaxial magnetic thin films usually domain wall motion is anticipated during magnetization reversal when measured along the easy axis. However magnetization reversal is governed by coherent rotation of spins along the hard axis. Recently there has been couple of reports where the field orientation dependent magnetization reversal in magnetic thin films has been studied [3-5]. Arregi et al. have demonstrated that a tuning of the applied field angle causes a most substantial variation of the magnetization reversal correlation length in partially epitaxial Co-