[III~17]

PROPERTIES OF Co/Ti MULTILAYERED FILMS

G. M. Lee,[1] K. W. Kim,[1] Y. V. Kudryavtsev,[1] L. Smardz,[2] and Y. P. Lee,[1]

[1]Dept. of Physics, Sunmoon University, Asan, Korea

[2]Institute of Molecular Physics, Poznan, Poland

INTRODUCTION

Compositionally-modulated multilayered films (MLF) where ferromagnetic and nonmagnetic sublyers are stacked alternatively have attracted a great attention, owing to their potential for new phenomena and advanced applications such as magneto-optical storage media and magnetic sensors. It is known that the interfacial regions play an important role in forming the properties of these artificial structures.

EXPERIMENTAL

Co/Ti MLF (d_{Co} = 10, 20, 25, 33 and 40 Å, d_{Ti} = 25 Å) were prepared onto glass substrates at room temperature by computer-controlled double-pair target face-to-face sputtering technique.

The experimental optical (optical conductivity) and magneto-optical (equatorial Kerr effect) properties were measured at room temperature in a spectral range of 250 - 1200 nm (1 - 5 eV). The magnetic properties were investigated as well. The theoretical simulations for the equatorial Kerr effect and optical conductivity spectra were performed by solving exactly a multireflection problem with a matrix method, assuming either sharp interfaces resulting in rectangular profiles of the constituent elements or mixed (alloyed) interfaces of various thicknesses between sublayers.

The surface morphology, mean grain and magnetic domain sizes, and size distribution of the grains and magnetic domains have been investigated by atomic force microscopy and magnetic force microscopy.

RESULTS AND DISCUSSION

All the magnetic, optical and magneto-optical results are correlated to show that the formation of ultrathin (8 - 10 Å) alloylike mixed interfacial regions between sublayers in all Co/Ti MLF. The MLF with the ferromagnetic sublayer thinner than a critical value of about 20 Å become nonmagnetic, which is analyzed to be connected with a crystalline-to-amorphous (or microcrystalline) structural transformation in the ferromagnetic sublayer.

The surface magnetic-domain and morphological structures representing the MLF with the crystalline and amorphous (or microcrystalline) Co sublayers are compared and interpreted.