

SYNTHESIS AND CHARACTERIZATION OF Dy-Ni-Fe ALLOY THIN FILMS USING ELECTRODEPOSITION TECHNIQUE

M. V. Khaddem-Mousavi, I. Z. Rahman and A. Gandhi

*Materials and Surface Science Institute (MSSI) & Department of Physics,
National Technological Park University of Limerick, Limerick, Ireland*

Contact: I. Z. Rahman, E-mail: zakia.rahman@ul.ie

Abstract

Recently there is a great interest shown for growing nanoscale thin films of transition metals and their alloys using electrodeposition technique due to several outstanding advantages over vacuum systems. Ultra thin ferromagnetic films on metallic substrates have become the subject of many investigations for its application potentiality in information technology. RE-TM alloy thin films are known to show perpendicular magnetic anisotropy, which is attractive for potential application in data storage.

In this paper we report on synthesis and characterization of Ni, Fe, and Dy to investigate the magnetic and nano structural properties of thin films using electrodeposition technique. An inorganic bath sulphate bath has been used to deposit the samples on aluminium substrates. The solubility degree of $\text{Dy}_2(\text{SO}_4)_3$ is found to be almost 100% when started with Dy_2O_3 that has been chemically treated to obtain the sulphates followed by heat treatment. The SEM, and AFM techniques are used to analyse the surface morphology (see figure 1) and XRD and EDAX are carried out to determine the crystal structure and the composition of the element in the films (See Figure 2). The magnetic properties are determined using Vibrating Sample Magnetometer. In all cases the film structure is found to be affected by deposition parameters such as pH, and temperature consequently having an influence on the magnetic properties of the films. In addition to that depending on the concentration of RE-content the deposited films structure varies from crystalline to amorphous that influences magnetic properties as well.

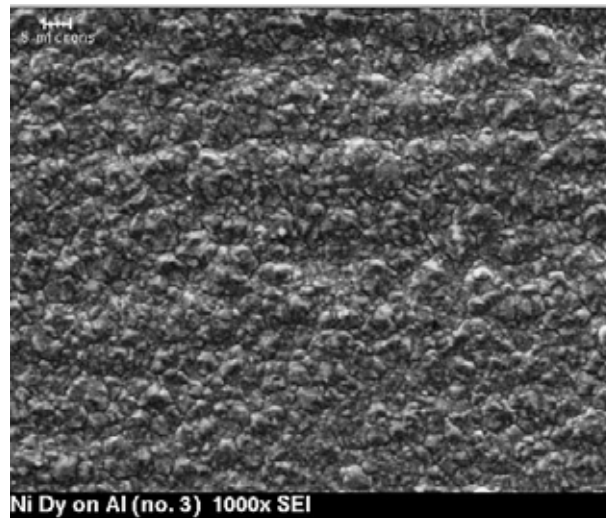
Figures:

Figure 1: SEM micrograph of Ni Dy electrodeposited at 50 °C, deposition time of 60 mins and pH 3.4 on Al substrate.

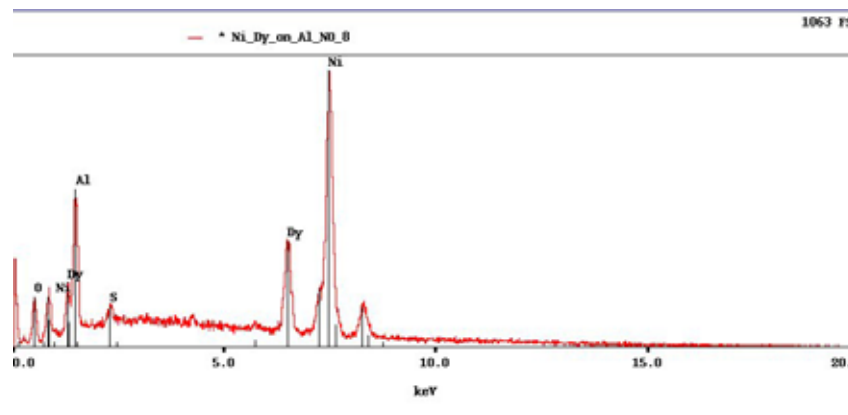


Figure 2: The EDAX result of Ni–Dy sample electrodeposited at 50 °C, deposition time of 60 minutes and pH 3.4 on Al substrate shows at weight of Dy and Ni at 3 0.6% and 32.39% respectively.