Magnetic microstructure of amorphous alloys studied using scanning electron microscopy with polarization analysis (abstract)

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The recent development of scanning electron microscopy with polarization analysis (SEMPA) has made the direct measurement of magnetic structures with submicron spatial resolution possible.[1,2] Because the secondary electron spin polarization is proportional to the magnetization in the area probed by the incident electron beam, the magnetization is measured directly, independent of topographic contrast. Topographic images are measured simultaneously, however, permitting comparisons between magnetic and structural properties. In addition the use of multiple, orthogonal detectors permits measurement of the magnetization magnitude and direction. We have recently used this technique to look at various Fe-rich amorphous ferromagnetic alloys. In particular SEMPA was used to examine the rotation of the magnetization within domain walls and to study changes in magnetic microstructure due to Ar ion bombardment and annealing.

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A fundamental parameters XRF approach for the determination of the composition and thickness of multilayer metal films (abstract)

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Analysis of the composition and thickness of magnetic thin films is important in controlling the properties of these materials. For instance, of all factors which determine the overall behavior of Permalloy films used in magnetic recording, composition is perhaps the most critical. For a film near the magnetomechanical zero point, a change in the composition of as little as 0.3% can alter the nature of the magnetization rotation process to the point where errors in readback occur. For this reason it is a necessity to perform accurate and precise analyses of the film composition. One means of performing rapid and precise analysis of these films is x-ray fluorescence (XRF). General algorithms have been developed to provide fundamental parameter corrections for XRF data from single and multilayer metal films. The corrections yield precise values for both thickness and composition. For example, the precision for a replicate analysis on a Permalloy sample was measured to be 80.34 $\pm$ 0.07% (weight) Ni (1σ). The fundamental parameter algorithms are quite general and are capable of dealing with variable compositions in each of the films in a multilayer stack. Previously, the restrictions were such that: (1) each element analyzed must appear only once in the films or substrate, and (2) the signal from each element is not obscured by that of another element. We have developed a procedure for the case where the substrate contains an element which is repeated once in the films, for example, nickel over alloy 42. In either case, the accuracy and precision of the measurement is improved if a substrate signal is observed.

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