



Experiment title: Study of crystallisation processes in CoPtCrNb model thin film media

Experiment number:
28-01-35

Beamline:
BM 28

Date of experiment:
from: 27/1/99 to: 1/2/99

Date of report:
16th April 1999

Shifts:
4

Local contact(s):
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Report:

At present there is much interest in the compositional and microstructural factors which give Co-based materials the necessary basic magnetic properties for application as advanced thin film storage media. Properties of interest include crystalline texture, grain segregation and grain size distribution [1]. Current commercial thin film media are often based on the CoCrPtTa system. The role of Cr in the Co-alloy is to promote decoupling of the magnetic grains in the media by segregation to the grain boundaries. The inclusion of Pt serves to increase the coercivity of the media by increasing the length of the c-axis of the Co and thus increases the magnetic anisotropy constant thereby increasing the coercivity of the media. Ta is known to promote low noise in the media as it promotes the Cr segregation. Recently Nb has been reported to fulfill a similar role as Ta in Co-Cr films [2] and furthermore was found to produce a lower noise medium. We have recently obtained a joint EPSRC grant (ref: GR/M23861) to study the magnetic and microstructural properties of sputter-deposited novel Co-alloy based model thin film media to be prepared at Salford.

Addition of Nb generally results in an amorphous structure unless the amount of Nb is controlled carefully or crystallisation is induced by heat treatment [2]. Our recent GIXS experiment at XMaS aimed to study the crystallisation processes in a set of identical CoCrPtNb films, subjected to different annealing conditions. However preliminary results were only obtained on one sample. This was due to the fact that two experiments were being carried out during the dates given at the top of this report and we decided that the other experiment was of a higher priority and so more shifts than expected were used for experiment 28-01-34 so that the work could be completed for publication [3].

A horizontal 2θ scan of a CoCrPtNb film annealed at 700°C is shown in figure 1. It can be seen from this figure that the crystalline phases formed upon annealing are complicated and as yet a full analysis of the data has not been completed. This film differs widely from the commercial thin film media we have previously measured since the diffraction patterns obtained were powder-like which suggests that there is very little orientation of the Co in or out of the plane [3]. Further work on a more carefully controlled set of samples is needed to try and understand the detail of the phases formed in these model thin film media.

References

- [1] K. O'Grady, P. Dova and H. Laidler, Proc. Mat. Res. Soc. Symp. 517 (1998) 231.
- [2] J. Ariake, N. Honda, T. Keitoku, K. Ouchi, S. Iwasaki, J.Magn.Magn.Mater. 155 (1996) 228.
- [3] H. Laidler, Experiment Report for XMaS experiment 28-01-34.

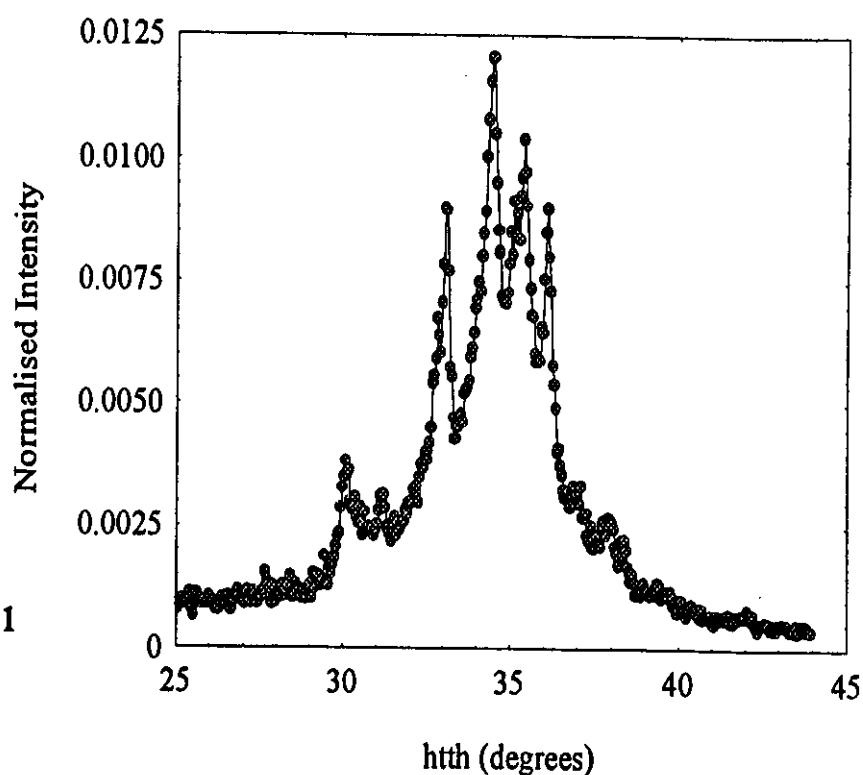


Figure 1