XMaS the UK-CRG	**Experiment title:** Measurement of stacking faults in CoPtCr thin film magnetic recording media	**Experiment number:** 28-01-34
Beamline: BM 28	**Date of experiment:** from: 27/1/99 to: 1/2/99	**Date of report:** 15th April 1999
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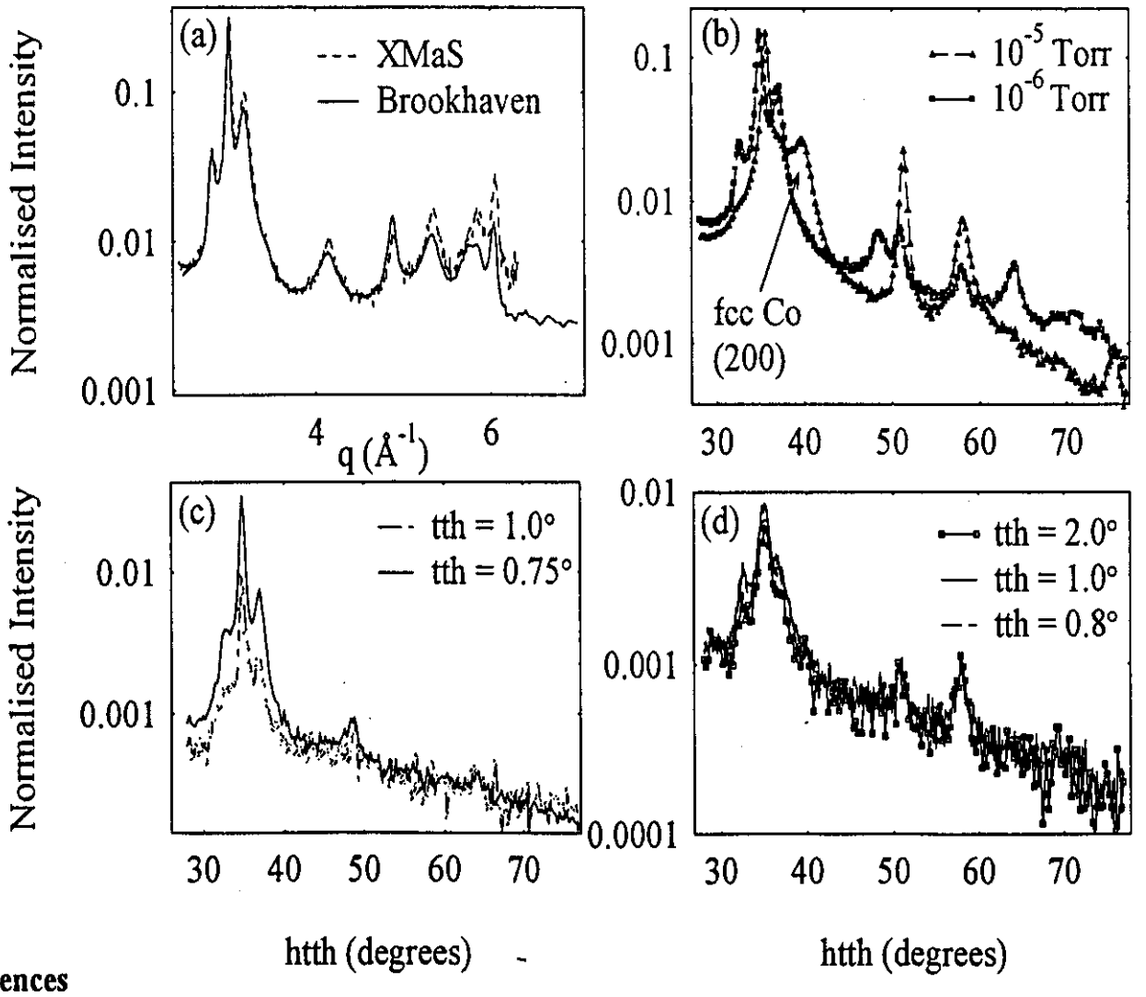
Report:

At present there is much interest in the effects of crystallographic defects in thin film magnetic recording media and their role in determining media noise and thermal loss of signal. Stacking faults are common in thin film media, which can contain as much as 10% of Co in the non-ideal hcp phase. Accurate quantification of the percentage of stacking faults in thin film media is not trivial and synchrotron radiation is employed with a grazing incidence geometry (GIXS) to eliminate the large background scatter from the underlayers and amorphous substrate [1]. In our first XMaS experiment (28-01-10) we used a sample already measured at Brookhaven by workers at IBM in order to make a comparison of XMaS with Brookhaven. Figure 1(a) shows comparable data collected over 8 hours at Brookhaven alongside data which took only 4 hours to collect at XMaS. The discrepancy at high values of q is due to polarisation effects from using the horizontal geometry at XMaS instead of the vertical geometry used at Brookhaven. In our first XMaS experiment we obtained data on 2 out of a set of 5 CoPtCr thin film media grown at different sputtering pressures by Seagate Magnetics [2]. Earlier qualitative HRTEM measurements had already provided evidence of increasing stacking fault density with higher sputtering pressures [3]. This has been confirmed

by the increased intensity of the fcc (200) reflection as shown in fig. 1(b). In this experiment we completed the data set for all 5 samples, enabling us to obtain a quantitative measure of the stacking fault density and type by fitting the horizontal 2θ scans. In addition, we have studied the c-axis orientation in and out of the plane. This was investigated by performing horizontal scans at varying angles of vertical 2θ and phi. For samples deposited at 10^{-5} Torr and below, the c-axis was seen to lie in the plane of the sample. For example, fig. 1(c) shows that for the 10^{-7} Torr sample, the hcp Co (002) peak falls off rapidly as vertical 2θ was increased indicating that the c-axis was lying in-plane. However fig. 1(d) shows similar scans for a sample grown in poor vacuum (10^{-4} Torr) and it can be seen that no variation in the intensity of the Co (002) peak was seen as vertical 2θ was increased which implies that the c-axis is distributed through a range of angles out of the plane. This is an important result as the magnetic and recording properties of this samples have been seen to be particularly poor. At present the results obtained from these experiments are being written up as a journal paper for J.Appl.Phys. and as a conference paper for the MMM conference.



References

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[2] H. Laidler, Preliminary experiment report for XMaS experiment 28-01-010.

[3] C.Gao, S.Wu, R.Malmhall, C.Habermeier, R.Sinclair, H.Laidler, K.O'Grady. IEEE Trans.Mag 34 (4) (1998) 1576.