Corrosion of Magnetic Recording Head Alloys

Yee Chin Tang[a], Alison J. Davenport[a] and
Peter K. McGeehin[b]
[a]The University of Birmingham
Department of Metallurgy and Materials,
Edgbaston, Birmingham B15 2TT, UK
[b]Seagate Technology, BT48 0BF, N. Ireland

With increased device performance and decreased structural dimensions of the magnetic recording heads in disc drives, it is desirable to reduce the Ni content of conventional CoFeNi alloys. Co and Fe possess better magnetic properties than Ni but shows inferior corrosion resistance. Corrosion is found during head fabrication, namely in the rinsing bath after plating and subsequent lapping processes. Electroplating still remains the most favourable processing route because of the low manufacturing cost. The corrosion is localised in nature, initiated at the surface inclusions.

In order to examine the effect of the Co-Fe ratio on corrosion, sputtered films were produced with a lateral composition gradient and no variations in microstructure with composition. The pitting potential was found to be higher with Co> 25 at %.

The pitting behaviour was studied for electroplated films using the 2-D pit growth technique on thin films materials (1, 2). A pit on a thin film will penetrate through the films and be constrained to grow radially as a thin cylindrical disc. This eliminates the ambiguity of the pit shapes and allows a close approximation of the pit active surface and therefore the pit current density. The growth of pit can be observed with an optical microscope, (see figures 1 &2) to allow the computation of the instantaneous current density, figure 3.

It is well known that the magnetic field can affect electrochemical processes as well as corrosion (3). The effect of magnetic fields on the corrosion of these metals was studied as the condition may be encountered during both head fabrication and in-service conditions. The effect was investigated using the 2-D pit growth on thin film and 1-D pit with embedded wire.

ACKNOWLEDGEMENTS

This work was in part supported by Seagate Technology, Ireland, UUK with an ORS award for YC Tang, and The University of Birmingham

REFERENCES

1. G. S. Frankel, J. O. Dukovic, V. Brusic, B. M. Rush and C. V. Jahnes, J. Electrochem. Soc., **139**, 2196 (1992)
2. G. S. Frankel, Corrosion Sci., **30**, 1203 (1990)
3. T. Z. Fahidy, J. Appl. Electrochem., **13**, 553 (1983)

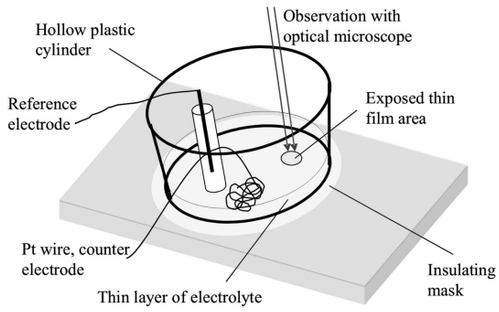

Figure 1. The schematic diagram for 2-D pit growth setup.

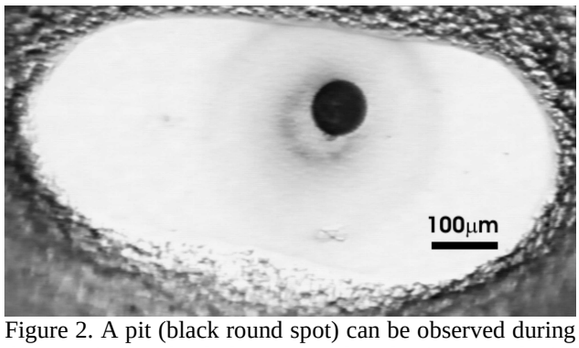

Figure 2. A pit (black round spot) can be observed during the experiment, the darker area at the edge is covered with insulating mask.

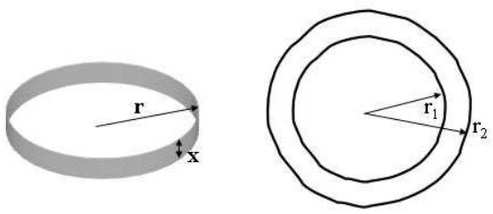

Figure 3. The active pit area is the side area of the cylindrical disc, $2\pi rx$. The pit radius increase with time, and therefore the active surface is changing instantaneously.