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링 헤드를 이용한 고밀도 수직자기기록

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HIGH DENSITY PERPENDICULAR MAGNETIC RECORDING WITH RING HEAD

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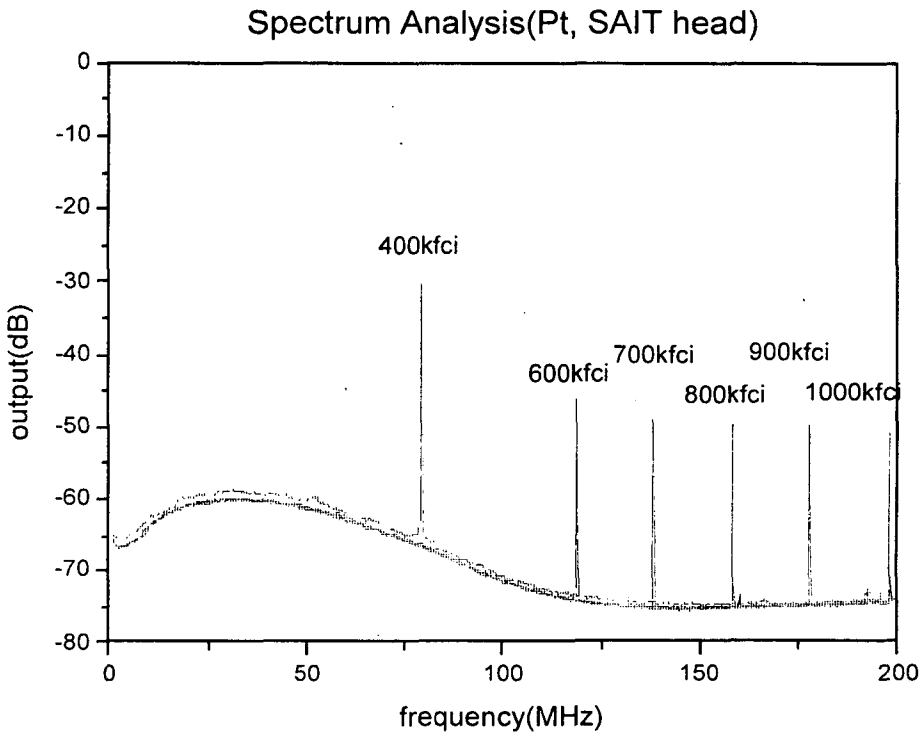
Perpendicular magnetic recording is a promising recording system for ultra high density. Since early 1980's [1], many material compositions, structures of media, and specified write head have been studied for perpendicular recording. Of all the combinations of head and media, CoCr based perpendicular media [2] and conventional ring type head is one of the most feasible candidates with its recording properties.

Because of its feasibility for implementation to disk drive, ring type head has been studied for perpendicular recording. But the head field and head field gradient were not enough for ultra high density recording and output dependency on writing current of ring head has shown insufficient saturation property. With development of MR sensor as read head and lower flying height, simply modified ring head is expected to overcome those problems and show much better recording properties in perpendicular recording. To improve the perpendicular field component of the ring head, pole shape of the ring head is optimized using head field simulations. With modifying the top pole shape, head field is much improved head field amplitude is increased 77.5% and the field gradient 250% compared with conventional ring head. MFM measurements show the improved recording pattern of the modified ring head.

We propose a new layer structure for perpendicular media consisting of CoCrX magnetic layer and Pt/Ti double under layers. Pt under layer reduces the lattice mismatch and improves the uniformity and the density of the grains. Ti cutting layer suppresses the continuous grain growth between magnetic layer and Pt under layer. Both the crystallographic and magnetic properties of this media are improved, compared with the single-layered CoCrX media. 50 measured by XRD is reduced 15% and uniform distribution of grains with diameter under 10nm is observed by TEM. Magnetic properties are measured with both VSM and Kerr microscope. Coercivity and squareness are increased over 12% amount. Volume Hc and surface Hc are not quite different with each other and it shows the suppressed initial layer growth of magnetic layer.

Fig 1. Shows the spectrum analyses at different densities up to 1000kfci. Pt/Ti double under layered media and optimized ring head is used. The decreasing rate of the output at higher density is very samll and it shows the recording possibility over 1000kfci. Other recording propertie such as ourput response for write current, SNR, overwrite, thermal decay and BER are examined. Writing demagnetization, a weak point of conventional ring head for perpendicular recording is much improved and the write current dependency of output has a good saturation feature. Double writing process of ring head helps overwriting and over 40dB is sustained up to 1000kfci.



References

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[2] K. Ouchi and N. Honda, "Overview of latest work on perpendicular recording media", IEEE Trans Magn., Vol. 36, No. 1, pp. 16-22, 2000