초청강연9

Next Generation Target of Electrochemical Techniques in Electronics Fields

Tetsuya Osaka

Department of Applied Chemistry, School of Science and Engineering; Kogami Memorial Laboratory for Materials Science and Technology, Waseda University, Shinjuku-ku, Tokyo, 169-8555 Japan

In the field of electronics, an importance of electrochemical techniques becomes realized in many processes, that is, interconnections of silicon devices, packaging processes, magnetic data storage devices etc.

In this presentation, I will mainly introduce thin film magnetic heads as one of the examples. In magnetic head processes, an electrodeposited technique works as one of the important key technologies such as an electrodeposited permalloy ($Ni_{81}Fe_{19}$ at.%) film of thin film inductive head. In 1990, IBM cooperation also firstly announced to ship a merged MR (magneto-resistive) head for the higher density recording. The increase of the areal density is accelerated faster and it becomes 100 times per decade. In a merged MR head, the read and write elements as separated each other. The write element is still using almost the same configuration as a thin-film inductive head. The read element consists of the multi- thin films prepared by sputtering, which exhibits a change in resistance in the presence of a magnetic field. Still now, the magnetic recording density greatly increases year by year.

A thin film medium should have high coercivity (H_c) of more than about 2.4×10^5A/m (3000 Oe) for higher density recording. In order to magnetize such a high H_c medium, a write head must generate stronger magnetic field. Therefore, as a core material of write element in a merged MR head it has to possess higher saturation magnetic flux density (B_s) value as compared with that of permalloy (B_s = 1.0T). Finally, in order to establish 20~40 Gbit/inch^2, the high Bs and high resistivity (ρ) materials should be developed to generate higher magnetic field with faster data transfer. In such circumstances, we developed soft magnetic films with high Bs (Bs = 2.0-2.1T, ρ = 25 $\mu\Omega$cm) and high ρ (B_s = 1.9T, ρ = 90 $\mu\Omega$cm) by electrodeposition. [1)-3)]

In conclusion such an electrochemical technique becomes much important in coming next centuries, and the control of the electrochemical processes gives us many challenges the electronics field.

References

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