

Perpendicular Magnetic Recording and Giant Magnetization of Fe₁₆N₂ Films

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The Perpendicular magnetic recording technology was proposed by Iwasaki and his coworkers of Tohoku University in 1977. Ever since extensive work has been carried out mostly in Japan, leading to the recent demonstration of a very high-density hard disk drive of 52.5Gb/in². This was achieved using a CoCrPt/FeTaC double layered medium and a single pole write head /GMR read head by Takano and his coworkers of Hitachi in collaboration with Tohoku University and AIT. Thinking of its higher thermal stability, it is likely that the perpendicular recording will be much more advantageous and dominant for hard disks of 100Gb/in² and beyond in future.

Giant magnetization of Fe₁₆N₂ was found by Kim and Takahashi of Tohoku University in 1972. Since then research for demonstration of 4πMs of 28kG for Fe₁₆N₂ has been extensively performed mostly in Japan, but no one had succeeded until Sugita and his coworkers of Hitachi demonstrated 4πMs of Fe₁₆N₂ to be 29kG and 32kG at room temperature and zero K, respectively in 1991. Those values are much higher than the calculated ones on the basis of the conventional band theory. Research on this issue has been done experimentally and theoretically again, however, the mechanism of giant magnetization has remained unclear. Giant magnetization of Fe₁₆N₂ is very attractive from aspects of applications and fundamental magnetism.

The author has been responsible for research on these subjects in Hitachi and later in Tohoku University, and still now continues collaboration with two groups.

In the first part of this talk, the latest progress of perpendicular recording, critical issues to be investigated for achievement of its realization, and future are mentioned based on data taken by Hitachi and Tohoku University. In the second part, experimental and theoretical data on giant magnetization of single phase, single crystal Fe₁₆N₂ films, a possible mechanism and problems to be solved are mentioned.