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NASA TECH BRIEF

Coercive Force of Thin Magnetic Films

A simple phenomenological model has been developed which may lead to a better understanding of the physics of thin-film magnetic-optic devices.

The study of coercive force in thin magnetic films has been confined primarily to films of NiFe, mainly because of the widespread application of this alloy in computer memories. Other films, such as MnBi and gadolinium iron garnet, also have shown promise of being useful in the area of computer memories. It is of both academic and practical importance to understand the mechanisms responsible for the easy-axis coercive force, H_c, in order that this parameter may be controlled in practice.

In the simple phenomenological model which has been developed, H_c contains a term which varies as t^{-1}, due to surface effects, plus another term which is independent of t. The constant term is the sum of a positive term due to the bulk material plus a surface-tension term which may be either positive or negative. The experimental data of other researchers have been found to fit this simple theory quite well, the coefficient of t^{-1} having been found to be 0.2 Oe-μm for NiFe films at the zero-magnetostriction composition (81%Ni-19%Fe). When compared with low scatter data, the surface term varied as t^{-1}, and not $t^{-4/3}$, the value previously theorized. It is felt that this simplified relationship will lead to a better understanding of the physics of thin-film magnetic-optic devices, and should permit further understanding and advancement of the art.

Notes:

1. See J.A. Baldwin, Jr., J. Appl. Phys. **38**, 501 (1967) for the comprehensive development of the mathematical model.
2. Requests for further information may be directed to:
   Technology Utilization Officer
   NASA Pasadena Office
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   Reference: B70-10221

Patent status:

No patent action is contemplated by NASA.

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