Book Review

APPLIED MAGNETISM

Edited by R. Gerber, C.D. Wright and G. Asti
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This book is based on contributions to the 25th International School of Materials Science and Technology held in Sicily, Italy in 1992. The topics covered in ten reviews included in the book comprise, among others, magnetic recording, magnetic properties of fine particles, magnetoresistance, and magneto-optics. The first contribution, *The physics of magnetic recording* by H.N. Bertram presents a review of the essential elements of magnetic recording, with emphasis on physical processes that occur in the writing of a data pattern onto the magnetic media.

M.H. Kryder's *Magnetic information storage* deals with the fundamental principles of magnetic and magneto-optic recording. Progress which enabled storage density to increase by more than 50 000 times in 35 years is described. This well written article covers, in a lucid and well-organised fashion, the fundamentals of the current status of the the magnetic information storage. Future prospects for ultra-high-density magneto-optic recording are also outlined. Only essential and illustrative mathematics is used and the review can be of benefit to a wide spectrum of readers.

Chapter on *Magnetoresistance* by D.J. Mapps reviews the phenomenon of magnetoresistance and outlines its growing importance in such fields as magnetic recording and detection of magnetic field. *Thin-film magneto-optics* by P.H. Lissberger is a comprehensive and detailed account of magneto-optical effects and of magneto-optical detection of magnetically stored information. D.D. Stancil's *Microwave and optical magnetics* overviews, with emphasis on physical models for the magnetic susceptibility, the properties of electromagnetic waves in ferrites, the magnetostatic approximation and devices. In a useful article *A scientific basis for computational magnetics* P.P. Silvester describes the scientific basis of computational magnetics based on classical mathematical models of electromagnetic and magnetic fields.

Of direct interest to the readers of this journal are three contributions. *The magnetic properties of fine particles* by R. W. Chantrell and K. O'Grady is a well-written and referenced article in which the authors introduce fundamental aspects of magnetism of fine particles and their application to topics such as magnetic fluids, time-dependence of the magnetisation and thermoremanent magnetisation. The article *Permanent magnets*, by G. Asti and M. Solzi, reviews the present status of permanent magnet technology. It also covers traditional subjects such as design of permanent magnet circuits, magnetisation and demagnetisation, the applications of permanent magnets that are already

well-documented in a variety of textbooks. Simultaneously, it gives a comprehensive overview of the latest generation of permanent magnets based on the intermetallic compounds of rare-earth and transition-metal elements.

A reader who wants to learn more about magnetic separation from the article *Magnetic separation* by R. Gerber will be probably warned by naivete of the introductory section where Gerber ventures into mineral processing and its jargon. From subsequent sections, a physicist will get a warped impression of what magnetic separation is, and a mineral technologist will be lost in heavy and superfluous mathematical physics. In Gerber's comprehension, magnetic separation is reduced to an interaction of a magnetisable particle with a single magnetised thin wire, a narrowly orientated, misguided and outmoded view. Fortunately, Gerber's beliefs are not shared by many these days as is illustrated by a highly selective references, the most recent ones being some 15 years old. Similarly, section on open-gradient magnetic separation describes, in immaterial mathematical detail, a technique which was never implemented on production scale and which was abandoned some ten years ago and has no relevance in the current practice of magnetic separation.

And thus only seven pages devoted to electromagnetic eddy-current separation are of serious interest and are recommended as a theoretical introduction to the subject. To concentrate the damage, Gerber managed to condense a wealth of fallacies about "magnetic separation" into two paragraphs of the conclusion. On the other hand, Gerber's treatment of the physics of interaction of a magnetisable particle with a magnetised wire or with an open-gradient magnetic field is elegant and authoritative. It is the field where Gerber is admirably strong and where he should concentrate his considerable talents and expertise.

To sum up, the articles in this book are topical and in most cases contain a wealth of interesting, clearly presented information, with heavy bias towards magnetic recording. The quality of production is very high: excellent illustrations, high-grade paper, printing and binding. This book will be a valuable addition to any collection covering applied magnetism.

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