

Book Review

HANDBOOK OF MAGNETIC MATERIALS, VOLUME 6

Edited by K.H.J. Buschow. North-Holland, Amsterdam 1991, 620 pp, US\$214.40

This is the sixth volume in the series formerly titled *Ferromagnetic Materials* and under the editorship of E.P. Wohlfarth. This authoritative set of books occupies a vital place in any book collection serving the needs of scientists and engineers interested in the magnetic properties of materials. The scope of the series has been broadened and extended beyond the originally planned four volumes in response to the rapid advances and diversification taking place in the field of magnetic materials, and it now takes in many forms of magnetic ordering besides ferromagnetic. Indeed, one of the chapters in this book deals with quasicrystals, which had not even been conceived of, let alone had their magnetic properties investigated, when the first volumes of the series appeared in 1980. The other topics covered in the present volume have all undergone major advances in the past decade and also no doubt merit the reviews contained in this volume.

The objectives of this series are twofold: to provide timely reviews of major developments in the field of magnetic materials, together with extensive compilations of data on these materials. The reviews cover physical, chemical, metallurgical and structural aspects of these materials, with the emphasis being on observed properties and the functional relationships between measured data. Relevant theory is by and large presented at a phenomenological level, with the results of more fundamental calculations being summarised. Brief mention is made of applications, but it is the materials' properties rather than their applications that is the focus of the reviews. These reviews are aimed at physicists, chemists and material scientists embarking on the study of some aspects of magnetic materials, or specialists in magnetism wanting to gain a broader perspective of the field. They also provide a coherent source of information on magnetic materials for design and development engineers. Theoreticians will find many results in these reviews that call for deeper understanding, and the codification of the experimental data will assist them in their endeavours.

The first two chapters, by H.S. Li and J.M.D. Coey and by A. Szytula, are on ternary rare-earth transition-metal compounds and intermetallics. While some aspects of these materials were reviewed in the first volume of the series, extensive developments have taken place since then, and almost all the information presented in these two chapters is new. Chapter 3, by O. Beckman and L. Lundgren, is on compounds of transition metals with the elements B, Si, Ge, Sn, P, As, Sb, Bi, and to a lesser extent S, Se and Te. This chapter represents a supplement to Booth's review on transition metal intermetallic compounds in Volume 4 of this series.

Chapter 4, by P. Hansen, is an extensive review of magnetic amorphous alloys, mainly dealing with alloys of rare earth elements with transition metals. These metal glasses show interesting forms of magnetic ordering which are unique to them. Quasicrystals are the subject of Chapter 5 by R.C. O'Handley, R.A. Dunlap and M.E. McHenry. These materials, first discovered by Shechtman and coworkers in 1984, possess long range orientational order, but the 5-fold and higher rotational symmetries which they display are incompatible with the long range translational order of conventional crystal lattices. These materials have had a profound impact on our concept of ordering in Nature, and they continue to throw up intellectual challenges, but as yet there does not seem to have been much progress towards their technological application.

Chapter 6, by G. Wiesinger and G. Hilscher, is on hydrides of transition-metal compounds, mainly featuring rare-earth elements. Transition-metal hydrides have attracted considerable attention because of their potential use for hydrogen storage, while transition-metal compounds are commercially important as the basis of high performance permanent magnets. The interest in the magnetic properties of the compound hydrides is sustained by the fact that hydrogen uptake causes expansion of the crystal lattice, thereby reducing the interaction between neighbouring atomic moments, and thus allowing a range of behaviour to be explored.

To sum up, the articles in this book are topical and contain a wealth of interesting information, with heavy bias towards rare-earth transition-metal systems. The quality of the production is up to the usual high standard of North-Holland. This book will be a valuable addition to any collection covering the magnetic properties of materials.

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