

HANDBOOK of MAGNETIC MATERIALS

VOLUME 12

EDITED BY

K.H.J. BUSCHOW

Van der Waals-Zeeman Institute
University of Amsterdam
Amsterdam
The Netherlands



1999

ELSEVIER

Amsterdam - Lausanne - New York - Oxford - Shannon - Singapore - Tokyo

CONTENTS

Preface to Volume 12	v
Contents	ix
Contents of Volumes 1-11	xi
List of Contributors	xv
1. Giant Magnetoresistance in Magnetic Multilayers A. BARTHÉLÉMY, A. FERT and F. PETROFF	1
2. NMR of Thin Magnetic Films and Superlattices P.C. RIEDI, T. THOMSON and G.J. TOMKA	97
3. Formation of 3d-Moments and Spin Fluctuations in Some Rare-Earth-Cobalt Compounds N.H. DUC and P.E. BROMMER	259
4. Magnetocaloric Effect in the Vicinity of Phase Transitions A.M. TISHIN	395
Author Index	525
Subject Index	559
Materials Index	565

CONTENTS OF VOLUMES 1-11

Volume 1

1. Iron, Cobalt and Nickel, <i>by E. P. Wohlfarth</i>	1
2. Dilute Transition Metal Alloys: Spin Glasses, <i>by J. A. Mydosh and G. J. Nieuwenhuys</i>	71
3. Rare Earth Metals and Alloys, <i>by S. Legvold</i>	183
4. Rare Earth Compounds, <i>by K. H. J. Buschow</i>	297
5. Actinide Elements and Compounds, <i>by W. Trzebiatowski</i>	415
6. Amorphous Ferromagnets, <i>by F. E. Luborsky</i>	451
7. Magnetostrictive Rare Earth-Fe ₂ Compounds, <i>by A. E. Clark</i>	531

Volume 2

1. Ferromagnetic Insulators: Garnets, <i>by M. A. Gilleo</i>	1
2. Soft Magnetic Metallic Materials, <i>by G. Y. Chin and J. H. Wernick</i>	55
3. Ferrites for Non-Microwave Applications, <i>by P. I. Slick</i>	189
4. Microwave Ferrites, <i>by J. Nicolas</i>	243
5. Crystalline Films for Bubbles, <i>by A. H. Eschenfelder</i>	297
6. Amorphous Films for Bubbles, <i>by A. H. Eschenfelder</i>	345
7. Recording Materials, <i>by G. Bate</i>	381
8. Ferromagnetic Liquids, <i>by S. W. Charles and J. Popplewell</i>	509

Volume 3

1. Magnetism and Magnetic Materials: Historical Developments and Present Role in Industry and Technology, <i>by U. Enz</i>	1
2. Permanent Magnets; Theory, <i>by H. Zijlstra</i>	37
3. The Structure and Properties of Alnico Permanent Magnet Alloys, <i>by R. A. McCurrie</i>	107
4. Oxide Spinel, <i>by S. Krupička and P. Novák</i>	189
5. Fundamental Properties of Hexagonal Ferrites with Magnetoplumbite Structure, <i>by H. Kojima</i>	305
6. Properties of Ferroplana-Type Hexagonal Ferrites, <i>by M. Sugimoto</i>	393
7. Hard Ferrites and Plastroferrites, <i>by H. Stäblein</i>	441
8. Sulphospinel, <i>by R. P. van Stapele</i>	603
9. Transport Properties of Ferromagnets, <i>by I. A. Campbell and A. Fert</i>	747

Volume 4

1. Permanent Magnet Materials Based on 3d-rich Ternary Compounds, <i>by K. H. J. Buschow</i>	1
2. Rare Earth-Cobalt Permanent Magnets, <i>by K. J. Strnat</i>	131

3. Ferromagnetic Transition Metal Intermetallic Compounds, *by J. G. Booth* 211
4. Intermetallic Compounds of Actinides, *by V. Sechovský and L. Havela* 309
5. Magneto-Optical Properties of Alloys and Intermetallic Compounds, *by K. H. J. Buschow* 493

Volume 5

1. Quadrupolar Interactions and Magneto-Elastic Effects in Rare-Earth Intermetallic Compounds, *by P. Morin and D. Schmitt* 1
2. Magneto-Optical Spectroscopy of f-Electron Systems, *by W. Reim and J. Schoenes* 133
3. INVAR: Moment-Volume Instabilities in Transition Metals and Alloys, *by E. F. Wasserman* 237
4. Strongly Enhanced Itinerant Intermetallics and Alloys, *by P. E. Brommer and J. J. M. Franse* 323
5. First-Order Magnetic Processes, *by G. Asti* 397
6. Magnetic Superconductors, *by Ø. Fischer* 465

Volume 6

1. Magnetic Properties of Ternary Rare-Earth Transition-Metal Compounds, *by H.-S. Li and J. M. D. Coey* 1
2. Magnetic Properties of Ternary Intermetallic Rare-Earth Compounds, *by A. Szytula* 85
3. Compounds of Transition Elements with Nonmetals, *by O. Beckman and L. Lundgren* 181
4. Magnetic Amorphous Alloys, *by P. Hansen* 289
5. Magnetism and Quasicrystals, *by R. C. O'Handley, R. A. Dunlap and M. E. McHenry* 453
6. Magnetism of Hydrides, *by G. Wiesinger and G. Hilscher* 511

Volume 7

1. Magnetism in Ultrathin Transition Metal Films, *by U. Gradmann* 1
2. Energy Band Theory of Metallic Magnetism in the Elements, *by V. L. Moruzzi and P. M. Marcus* 97
3. Density Functional Theory of the Ground State Magnetic Properties of Rare Earths and Actinides, *by M. S. S. Brooks and B. Johansson* 139
4. Diluted Magnetic Semiconductors, *by J. Kossut and W. Dobrowolski* 231
5. Magnetic Properties of Binary Rare-Earth 3d-Transition-Metal Intermetallic Compounds, *by J. J. M. Franse and R. J. Radwański* 307
6. Neutron Scattering on Heavy Fermion and Valence Fluctuation 4f-systems, *by M. Loewenhaupt and K. H. Fischer* 503

Volume 8

1. Magnetism in Artificial Metallic Superlattices of Rare Earth Metals, *by J. J. Rhyne and R. W. Erwin* 1
2. Thermal Expansion Anomalies and Spontaneous Magnetostriction in Rare-Earth Intermetallics with Cobalt and Iron, *by A. V. Andreev* 59
3. Progress in Spinel Ferrite Research, *by V. A. M. Brabers* 189
4. Anisotropy in Iron-Based Soft Magnetic Materials, *by M. Soini and A. J. Moses* 325
5. Magnetic Properties of Rare Earth-Cu₂ Compounds, *by Nguyen Hoang Luong and J. J. M. Franse* 415

Volume 9

1. Heavy Fermions and Related Compounds, *by G. J. Nieuwenhuys* 1
2. Magnetic Materials Studied by Muon Spin Rotation Spectroscopy, *by A. Schenck and F. N. Gygax* 57

3. Interstitially Modified Intermetallics, *by J. J. M. Franse and R. J. Radwański* 1
4. Field Induced Phase Transitions, *by J. J. M. Franse and R. J. Radwański* 1
5. Photon Beam Studies of Magnetic Materials, *by J. J. M. Franse and R. J. Radwański* 1

Volume 10

1. Normal-State Magnetic Properties of Rare-Earth Intermetallics, *by D. C. Johnson* 1
2. Magnetism of Compounds of Rare-Earth Elements, *by J. J. M. Franse and R. J. Radwański* 1
3. Nanocrystalline Soft Magnetic Materials, *by J. J. M. Franse and R. J. Radwański* 1
4. Magnetism and Processing of Intermetallics, *by J. J. M. Franse and R. J. Radwański* 1

Volume 11

1. Magnetism of Ternary Intermetallics, *by J. J. M. Franse and R. J. Radwański* 1
2. Magnetic Recording Hard Disks, *by J. J. M. Franse and R. J. Radwański* 1
3. Magnetism of Permanent Magnets, *by J. J. M. Franse and R. J. Radwański* 1
4. Crystal Field Effects in Intermetallics, *by J. J. M. Franse and R. J. Radwański* 1

3. Interstitially Modified Intermetallics of Rare Earth and 3d Elements, *by H. Fujii and H. Sun* 303
4. Field Induced Phase Transitions in Ferrimagnets, *by A.K. Zvezdin* 405
5. Photon Beam Studies of Magnetic Materials, *by S.W. Lovesey* 545

Volume 10

1. Normal-State Magnetic Properties of Single-Layer Cuprate High-Temperature Superconductors and Related Materials, *by D.C. Johnston* 1
2. Magnetism of Compounds of Rare Earths with Non-Magnetic Metals, *by D. Gignoux and D. Schmitt* 239
3. Nanocrystalline Soft Magnetic Alloys, *by G. Herzer* 415
4. Magnetism and Processing of Permanent Magnet Materials, *by K.H.J. Buschow* 463

Volume 11

1. Magnetism of Ternary Intermetallic Compounds of Uranium, *by V. Sechovský and L. Havela* 1
2. Magnetic Recording Hard Disk Thin Film Media, *by J.C. Lodder* 291
3. Magnetism of Permanent Magnet Materials and Related Compounds as Studied by NMR, *by Cz. Kapusta, P.C. Riedi and G.J. Tomka* 407
4. Crystal Field Effects in Intermetallic Compounds Studied by Inelastic Neutron Scattering, *by O. Moze* 493