

Contents

List of Contributors	ix
Preface	xi
Contents of Volumes 1–24	xv
1. Physics and Magnetism of Quaternary Heusler Alloys	1
<i>L. Bainsla and K.G. Suresh</i>	
1. Introduction	2
1.1 Crystal Structure of Heusler Alloys	4
1.2 Electronic Structure	5
1.3 Origin of the Half-Metallic Gap	6
1.4 Magnetism in Heusler Alloys	9
1.5 Spin Polarization (P_C)	10
1.6 Electrical Resistivity	11
1.7 Potential Applications of HMF Materials	13
2. Results on Substituted Quaternary Heusler Alloys	13
2.1 Fe ₂ -Based Alloys	13
2.2 Co ₂ -Based Alloys	20
3. Results on Equiatomic Heusler Alloys	36
3.1 Structural Aspects	36
3.2 Magnetic Properties	44
3.3 Magneto Transport Properties	50
3.4 Spin Polarization Using PCAR	54
3.5 Electronic Structure Calculations	55
4. Summary and Conclusions	61
References	62
2. Elastic Neutron Diffraction on Magnetic Materials	67
<i>K. Prokeš and F. Yokaichiya</i>	
1. Introduction	68
2. Basic Properties of a Neutron	68
3. What is a Magnetic Material and a Magnetic Structure ?	70
3.1 Origin of Magnetic Moments	70
3.2 Definition of a Magnetic Structure	72

4. Essentials of Elastic Neutron Diffraction	76		
4.1 Basic Formulas	76		
4.2 Nuclear Diffraction	78		
4.3 Magnetic Diffraction	82		
5. Classification of Magnetic Structures	84		
5.1 Commensurate Magnetic Structures	85		
5.2 Incommensurate Magnetic Structures	87		
5.3 Multi- <i>k</i> Structures	89		
5.4 K and S Magnetic Domains	91		
6. Identification of Magnetic Signal in Practice	92		
6.1 Determination of Magnetic Structures	92		
6.2 Limitations of the Neutron Technique	95		
7. Short Introduction to Representation Group Theory	96		
8. Instrumentation	99		
8.1 Neutron Sources	99		
8.2 Data Collection Methods	100		
9. Examples of Magnetic Structure Determinations	120		
9.1 Example I: Powder Sample of UPdSi	120		
9.2 Example II: Single Crystal of UNiGa	126		
10. Concluding Remarks	136		
Acknowledgments	137		
References	137		
3. Mössbauer Spectroscopy on rare Earth-Based Oxides	145		
<i>P.C.M. Gubbens</i>			
1. Introduction	145		
2. Rare Earth Mössbauer Spectroscopy and Methodology	147		
2.1 The Recoilless Fraction	147		
2.2 Nuclear Energy Levels	147		
2.3 Methodology of Rare Earth Mössbauer Spectroscopy	149		
3. Theoretical Aspects	153		
3.1 Introduction	153		
3.2 Crystal Fields	153		
3.3 Magnetic Interaction	156		
3.4 Relation to Mössbauer Parameters	160		
3.5 Magnetic Relaxation	163		
3.6 Analysis Procedure: Examples	165		
4. Overview of Rare Earth-Based Oxides	171		
4.1 Introduction	171		
4.2 R ₂ O ₃ Compounds	171		
4.3 RMO ₃ Compounds	175		
4.4 RMO ₄ Compounds	182		
4.5 RBa ₂ Cu ₃ O ₇ Compounds	194		
4.6 R ₂ BaMO ₅ Compounds	206		
		4.7 R ₂ M ₂ O ₇ Compounds	215
		4.8 R ₃ M ₅ O ₁₂ Compounds	225
		5. Conclusions, Justification, and Acknowledgment	229
		References	231
		Author Index	237
		Subject Index	249
		Material Index	257