

CONTENTS

INTRODUCTION.....	2
Chapter 1. EFFECTS OF CRYSTAL FIELD AND QUADRUPOLE INTERACTIONS IN RARE-EARTH ZIRCONS.....	8
§1. CF effects and crystal structure of rare-earth zircons.....	8
§2. Calculation methods.....	18
Chapter 2. CALCULATION OF ELECTRONIC STRUCTURE OF RARE-EARTH IONS AND THERMODYNAMICAL CHARACTERISTICS OF RARE-EARTH COMPOUNDS.....	32
§1. Crystal Field.....	33
§2. Hyperfine interactions in rare-earth compounds.....	40
1. Magnetic hyperfine interactions.....	40
2. Quadrupole hyperfine interactions.....	46
3. Effective nuclear spin-Hamiltonian and enhanced nuclear magnets.....	49
§3. Magnetocaloric effect and heat capacity.....	55
§4. Spin-lattice relaxation.....	60
Chapter 3. THERMAL EXPANSION ANOMALIES OF RARE-EARTH VANADATES DUE TO QUADRUPOLE ORDERING.....	78
§1. Calculation of low-symmetry and fully symmetric modes.....	79
§2. TbVO ₄	83
§3. DyVO ₄	90
§4. Conclusions.....	101
Chapter 4. ANOMALIES OF MAGNETIC PROPERTIES AND MAGNETOCALORIC EFFECT CAUSED BY CROSSOVER IN RARE-EARTH ZIRCONS.....	104
§1. YbPO ₄ . Effects at ultrahigh fields.....	106
§2. PrVO ₄ . Effects of hyperfine interactions.....	121
§3. HoVO ₄ . Magnetocaloric effect in pulsed magnetic fields.....	142
§4. Conclusions.....	145
Chapter 5. CHARACTERISTIC MAGNETOELASTIC ANOMALIES OF DyPO₄ CAUSED BY INTERACTION OF LEVELS.....	147
§1. Magnetic anomalies.....	147
§2. Magnetoelastic anomalies.....	157
§3. Conclusions.....	164
CONCLUSION.....	166