1. Record Nr. UNISA996466736603316

Autore	Bulou Herve
Titolo	Magnetism and Accelerator-Based Light Sources : Proceedings of the 7th International School "Synchrotron Radiation and Magnetism", Mittelwihr (France) 2018
Pubbl/distr/stampa	Springer Nature, 2021 Cham : , : Springer International Publishing AG, , 2021 ©2021
ISBN	3-030-64623-8
Descrizione fisica	1 online resource (219 pages)
Collana	Springer Proceedings in Physics ; ; v.262
Altri autori (Persone)	JolyLoic MariotJean-Michel ScheurerFabrice
Soggetti	Spectrum analysis, spectrochemistry, mass spectrometry Atomic & molecular physics Optical physics Fluid mechanics Circuits & components
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Foreword -- Preface -- Teachers -- Scientific Committee -- Acknowledgements -- Contents -- Contributors -- 1 X-Ray Sources at Large-Scale Facilities -- 1.1 Introduction -- 1.2 A Brief Description of Synchrotrons -- 1.2.1 Introduction -- 1.2.2 The Lorentz Factor -- 1.2.3 Dipole Radiation and Synchrotron Radiation -- 1.2.4 Spectral Flux, Emittance, and Brilliance -- 1.2.5 The Radio-Frequency Power Supply -- 1.2.6 Radiation Equilibrium -- 1.2.7 Coherence -- 1.3 Sources of Synchrotron Radiation -- 1.3.1 Bending Magnets and Wigglers -- 1.3.2 Undulators -- 1.3.3 Polarization of Synchrotron Radiation -- 1.4 Diffraction-Limited Storage Rings -- 1.5 X-Ray Free-Electron Lasers -- 1.5.1 XFEL Architecture -- 1.5.2 The SASE Process -- 1.5.3 Concluding Remarks -- 1.6 Summary -- References -- 2 Concepts in Magnetism -- 2.1 Introduction -- 2.2 Exchange -- 2.2.1 Direct Exchange -- 2.2.2 Indirect Exchange -- 2.2.3 Superexchange --

2.3 Consequences of the Heisenberg Exchange Interaction -- 2.3.1 Two Interacting Spin-12 Particles -- 2.3.2 A Chain of Spins -- 2.3.3 Three Spins -- 2.4 Orbitals -- 2.4.1 Transition Metal Ions -- 2.4.2 Spin-Orbit Interaction and Crystal Fields -- 2.4.3 Jahn-Teller Effect -- 2.5 Conclusion -- References -- 3 Electronic Structure Theory for X-Ray Absorption and Photoemission Spectroscopy -- 3.1 Introduction -- 3.2 Light-Matter Interaction -- 3.3 Ground State Electronic Structure Theory -- 3.3.1 Hartree-Fock Approximation -- 3.3.2 Density Functional Theory -- 3.4 Absorption Spectra in the Independent Particle Approximation -- 3.4.1 Dipole Selection Rules and Density of States -- 3.5 Absorption Spectra in Linear Response TDDFT -- 3.5.1 Time-Dependent Density Functional Theory -- 3.5.2 Linear Response Theory -- 3.5.3 Absorption Spectra -- 3.6 Photoemission Spectroscopy -- 3.6.1 Angle-Resolved Photoemission Spectroscopy.
3.7 Quasiparticle Theory -- 3.7.1 Green's Functions -- 3.7.2 GW Approximation -- 3.7.3 Bethe-Salpeter Equation -- 3.7.4 Static and Dynamical Mean-Field Theory -- 3.8 Conclusions -- References -- 4 X-ray Dichroisms in Spherical Tensor and Green's Function Formalism -- 4.1 Introduction -- 4.1.1 The X-ray Absorption Cross Section -- 4.1.2 Definition of Dichroisms -- 4.1.3 The Many-Body Problem in Spectra Calculations -- 4.1.4 Codes for Ligand-Field Multiplet Calculations -- 4.2 Spherical Tensor Expansion of the XAS Cross Section -- 4.2.1 The Case of Electric Dipole Transitions -- 4.2.2 The Case of Electric Quadrupole Transitions -- 4.2.3 Term a=0 -- 4.2.4 Term a=1 -- 4.2.5 Term a=2 -- 4.2.6 Term a=3 -- 4.2.7 Term a=4 -- 4.3 Conclusion -- References -- 5 Spintronics and Synchrotron Radiation -- 5.1 General Introduction to Spintronics: From Magnetoresistive Effects to the Physics of Spin-Transfer Phenomena -- 5.1.1 Giant Magnetoresistance: An Historical Point of View -- 5.1.2 Tunnelling Magnetoresistance -- 5.1.3 Magnetization Manipulation without Magnetic Fields -- 5.1.4 Summary -- 5.2 Examples of Synchrotron Radiation Contribution to Spintronics -- 5.2.1 Voltage Control of Magnetism -- 5.2.2 Spintronics with Pure Spin Current -- 5.2.3 Current-Induced Magnetization Dynamics -- 5.3 Conclusion -- References -- 6 p-Wave Superconductivity and d-Vector Representation -- 6.1 Introduction -- 6.2 Odd-Parity Pairing: BCS Wave Function and Order Parameter -- 6.3 Vectors and Cayley-Klein Representation -- 6.3.1 Position of the Problem -- 6.3.2 Useful Formula for Pauli Matrices -- 6.3.3 Rotation of a 3D Vector: Cayley-Klein Relation -- 6.4 d-Vector Representation -- 6.5 Behaviour under Rotations -- 6.5.1 Rotation in Spin Space -- 6.5.2 Rotation in Real Space -- 6.5.3 Change of Quantization Axis: Application to ESP States.
6.6 Some Uses of the d-Vector Representation -- 6.6.1 Amplitude of the d-Vector -- 6.6.2 Spin Direction -- 6.6.3 Non-unitary States -- 6.6.4 Orbital Moment -- 6.6.5 Excitation Energy of Quasiparticles -- 6.7 The Spin-Orbit Issue -- 6.7.1 Spin-Orbit and the Superconducting Order Parameter -- 6.7.2 Anisotropy of the Susceptibility for the Strong Spin-Orbit Case -- 6.8 d d d d-vector Representation of Some Known (or Suspected) p-Wave Superconductors -- 6.8.1 Phases of Superfluid 3He -- 6.8.2 UPt3 and Sr2RuO4 -- 6.9 Ferromagnetic Superconductors -- 6.9.1 ESP States -- 6.9.2 Symmetries -- 6.9.3 Microscopic Model -- 6.10 UTe2 -- 6.11 Proofs and Exercise Solutions -- 6.11.1 Proof of the Cayley-Klein Relation -- 6.11.2 Conservation of the Scalar Product under Rotation with the Definition (6.11) -- 6.11.3 Conservation of the Cross Product under Rotation with the Definition (6.11) -- 6.11.4 Rotation of the d d d d-Vector of a Simple ``Up-Up'' State -- 6.11.5 Equivalence of ESP Unitary States and Pure |Sz=0rangle States -- References -- Index.

Sommario/riassunto

This open access book collects the contributions of the seventh school on Magnetism and Synchrotron Radiation held in Mittelwihr, France, from 7 to 12 October 2018. It starts with an introduction to the physics of modern X-ray sources followed by a general overview of magnetism. Next, light / matter interaction in the X-ray range is covered with emphasis on different types of angular dependence of X-ray absorption spectroscopy and scattering. In the end, two domains where synchrotron radiation-based techniques led to new insights in condensed matter physics, namely spintronics and superconductivity, are discussed. The book is intended for advanced students and researchers to get acquaintance with the basic knowledge of X-ray light sources and to step into synchrotron-based techniques for magnetic studies in condensed matter physics or chemistry.