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Spin Resonance Spectroscopy: Principles and applications

4 January 2018, Pages 169-228

Electron Paramagnetic Resonance Spectroscopy (Book Chapter)

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Abstract

Electron paramagnetic resonance (EPR) is the only unambiguous technique to investigate directly the free radicals and paramagnetic compounds viz., transition metal ions, triplet states, etc. So, in this chapter, the principles of EPR, instrumentation (parallel and perpendicular modes), and presentation of spectra are discussed. The Spin Hamiltonian equation used to describe the EPR spectra and parameters are explained. The determination of g-values including factors affecting its magnitude, reference samples, isotropic hyperfine interaction, EPR of hydrogen atom, and free radicals in solution are presented. g- and A-tensor anisotropy, zero-field splitting, Kramer's theory and degeneracy, exchange-coupled EPR, half-field transition, and triplet-state EPR are highlighted. Optically Detected Magnetic Resonance (ODMR), a double resonance technique for studying triplet states is also discussed. The effect Jahn-Teller (JT) coupling/distortion on EPR and optical spectra, its types, consequences, and applications of JT are presented. A brief account and useful list of computer simulation software are also given. © 2018 Elsevier Inc. All rights reserved.

Author keywords

Exchange coupled | Half-field transition | JT coupling | Kramer's theory | ODMR | Simulation | Spin Hamiltonian | Triplet | Zero-field

ISBN: 978-012813609-6;978-012813608-9
DOI: 10.1016/B978-0-12-813608-9.00004-6
Source Type: Book
Document Type: Book Chapter
Original language: English
Publisher: Elsevier

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Chapters in this book

Cited by 10 documents

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