

FILLS A 40-YEAR GAP IN THE LITERATURE OF THE FIELD...

Optical Spectroscopy of Lanthanides

Magnetic and Hyperfine Interactions

NEW!

Brian G. Wybourne

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and Nicolaus Copernicus University, Toruń, Poland

State-of-the-Art Treatment Helps Scientists Explore Lanthanides' Potential

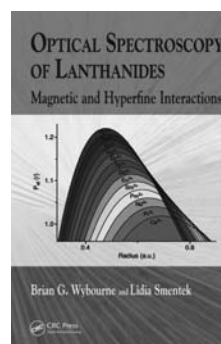
Optical Spectroscopy of Lanthanides: Magnetic and Hyperfine Interactions represents the sixth and final book by the late Brian Wybourne, an accomplished pioneer in the spectroscopy of rare earth ions, and Lidia Smentek, a leading theoretical physicist in the field. The book provides a definitive and up-to-date theoretical description of spectroscopic properties of lanthanides doped in various materials.

The book integrates computer-assisted calculations developed since Wybourne's classic publication on the topic. It contains useful Maple™ routines, discussions, and new aspects of the theory of f-electron systems. Establishing a unified basis for understanding state-of-the-art applications and techniques used in the field, the book reviews fundamentals based on Wybourne's graduate lectures, which include the theory of nuclei, the theory of angular momentum, Racah algebra, and effective tensor operators. It then describes magnetic and hyperfine interactions and their impact on the energy structure and transition amplitudes of the lanthanide ions. The text culminates with a relativistic description of $f \leftrightarrow f$ electric and magnetic dipole transitions, covering sensitized luminescence and a new parametrization scheme of f-spectra.

Optical Spectroscopy of Lanthanides enables scientists to construct accurate and reliable theoretical models to elucidate lanthanides and their properties. This text is ideal for exploring a range of lanthanide applications including electronic data storage, lasers, superconductors, medicine, nuclear engineering, and nanomaterials.

FEATURES

- Highlights the impact of lanthanides on modern technology, medicine, biochemistry, and molecular biology
- Contains numerous exercises, sample programs, and worked examples throughout
- Introduces a new role of magnetic and hyperfine interactions in the description of $f \leftrightarrow f$ transitions
- Presents values of all radial integrals existing in the theory of f-spectra for all lanthanide ions
- Distinguishes intra- and inter-shell interactions in terms of appropriate Hamiltonians and partitioning of space
- Highlights lanthanide applications, including non-invasive detection and monitoring of cancer cells in various tissues



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