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Nota di contenuto	An Introduction to the Optical Spectroscopy of Inorganic Solids; Contents; Preface; Acknowledgments; Some Physical Constants of Interest in Spectroscopy; A Periodic Table of the Elements for Optical Spectroscopy; 1 Fundamentals; 1.1 The Origins of Spectroscopy; 1.2 The Electromagnetic Spectrum and Optical Spectroscopy; 1.3 Absorption; 1.3.1 The Absorption Coefficient; 1.3.2 The Measurement of Absorption Spectra: The Spectrophotometer; 1.3.3 Reflectivity; 1.4 Luminescence; 1.4.1 The Measurement of Photoluminescence: The Spectrofluorimeter; 1.4.2 Luminescent Efficiency

1.4.3 Stokes and Anti-Stokes Shifts 1.4.4 Time-Resolved Luminescence; 1.5 Scattering: The Raman Effect; 1.6 Advanced Topic: The Fourier Transform Spectrometer; Exercises; References and Further Reading; 2 Light Sources; 2.1 Introduction; 2.1.1 Thermal Radiation and Planck's Law; 2.2 Lamps; 2.2.1 Tungsten and Quartz Halogen Lamps; 2.2.2 Spectral Lamps; 2.2.3 Fluorescent Lamps; 2.2.4 High-Pressure Discharge Vapor Lamps; 2.2.5 Solid State Lamps; 2.3 The Laser; 2.3.1 Lasers as Light Sources in Spectroscopy; 2.3.2 The Basic Principles of Lasers; 2.3.3 Population Inversion: the Threshold Condition 2.3.4 Pumping Techniques 2.3.5 The Resonator; 2.4 Types of Lasers; 2.4.1 The Excimer Laser; 2.4.2 Gas Lasers; 2.4.3 Dye Lasers; 2.4.4 Semiconductor Lasers; 2.4.5 Solid State Lasers; 2.5 The Tunability of Laser Radiation; 2.5.1 Tunable Solid State Lasers; 2.5.2 Tunable Coherent Radiation by Frequency-Mixing Techniques; 2.5.3 Optical Parametric Oscillation and Amplification; 2.6 Advanced Topics: Site Selective Spectroscopy and Excited State Absorption; 2.6.1 Site Selective Spectroscopy; 2.6.2 Excited State Absorption; Exercises; References and Further Reading; 3 Monochromators and Detectors 3.1 Introduction 3.2 Monochromators; 3.3 Detectors; 3.3.1 Basic Parameters; 3.3.2 Types of Detectors; 3.4 The Photomultiplier; 3.4.1 The Working Principles of a Photomultiplier; 3.4.2 Noise in Photomultipliers; 3.5 Optimization of the Signal-to-Noise Ratio; 3.5.1 The Averaging Procedure; 3.5.2 The Lock-in Amplifier; 3.5.3 The Photon Counter; 3.5.4 The Optical Multichannel Analyzer; 3.6 Detection of Pulses; 3.6.1 Digital Oscilloscopes; 3.6.2 The Boxcar Integrator; 3.7 Advanced Topics: The Streak Camera and the Autocorrelator; 3.7.1 The Streak Camera; 3.7.2 The Autocorrelator; Exercises References and Further Reading 4 The Optical Transparency of Solids; 4.1 Introduction; 4.2 Optical Magnitudes and the Dielectric Constant; 4.3 The Lorentz Oscillator; 4.4 Metals; 4.4.1 Ideal Metal; 4.4.2 Damping Effects; 4.5 Semiconductors and Insulators; 4.6 The Spectral Shape of the Fundamental Absorption Edge; 4.6.1 The Absorption Edge for Direct Transitions; 4.6.2 The Absorption Edge for Indirect Transitions; 4.7 Excitons; 4.7.1 Weakly Bound (Mott-Wannier) Excitons; 4.7.2 Tightly Bound (Frenkel) Excitons; 4.8 Advanced Topic: The Color of Metals; Exercises; References and Further Reading 5 Optically Active Centers

Sommario/riassunto

This practical guide to spectroscopy and inorganic materials meets the demand from academia and the science community for an introductory text that introduces the different optical spectroscopic techniques, used in many laboratories, for material characterisation. Treats the most basic aspects to be introduced into the field of optical spectroscopy of inorganic materials, enabling a student to interpret simple optical (absorption, reflectivity, emission and scattering) spectra. Contains simple, illustrative examples and solved exercises. Covers the theory, instrumentat