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3.1.3 Band-to-Band Transitions3.1.4 Excitonic Transitions; 3.2 Optical Transitions in ZnO; 3.2.1 Free Excitons and Polaritons; 3.2.2 Bound Excitons; 3.2.3 Two-Electron Satellites in PL; 3.2.4 DAP and Shallow Acceptor-Bound Exciton Transitions and LO-Phonon Replicas in PL; 3.2.5 Temperature-Dependent PL Measurements; 3.3 Defects in ZnO; 3.3.1 Predictions from First Principles; 3.3.2 Defect-Related Optical Transitions in ZnO; 3.3.2.1 Green Luminescence Band; 3.3.2.2 Yellow Luminescence Band; 3.3.2.3 Red Luminescence Band; 3.4 Refractive Index of ZnO and MgZnO; 3.5 Stimulated Emission in ZnO
3.5.1 Polycrystalline ZnO Films and"Random Lasers"3.5.2 Multiple Quantum Wells; 3.6 Recombination Dynamics in ZnO; 3.7 Nonlinear Optical Properties; 3.7.1 Second-Order Nonlinear Optical Properties; 3.7.1.1 Second-Harmonic Generation; 3.7.2 Third-Order Nonlinear Optical Properties; 3.7.2.1 Third Harmonic Generation; 3.7.3 Intensity Dependent Refractive Index; 3.7.4 Two-Photon Absorption; References; 4 Doping of ZnO; 4.1 n-Type Doping; 4.2 p-Type Doping; 4.2.1 Nitrogen Doping; 4.2.2 Codoping Method; 4.2.3 Other Dopants in Group V; 4.2.4 Concluding Remarks on Reliability of p-Type ZnO References5 ZnO-Based Dilute Magnetic Semiconductors; 5.1 Doping with Transition Metals; 5.2 General Remarks About Dilute Magnetic Semiconductors; 5.3 Classification of Magnetic Materials; 5.4 A Brief Theory of Magnetization; 5.5 Dilute Magnetic Semiconductor Theoretical Aspects; 5.6 Measurements Techniques for Identification of Ferromagnetism; 5.7 Magnetic Interactions in DMS; 5.7.1 Carrier-Single Magnetic Ion Interaction; 5.7.2 Interaction Between Magnetic Ions; 5.7.2.1 Superexchange Mechanism; 5.7.2.2 Blombergen-Rowland Mechanism; 5.7.2.3 Double Exchange Interaction
5.7.2.4 Ruderman-Kittel-Kasuya-Yoshida Mechanism

Sommario/riassunto

This first systematic, authoritative and thorough treatment in one comprehensive volume presents the fundamentals and technologies of the topic, elucidating all aspects of ZnO materials and devices. Following an introduction, the authors look at the general properties of ZnO, as well as its growth, optical processes, doping and ZnO-based dilute magnetic semiconductors. Concluding sections treat bandgap engineering, processing and ZnO nanostructures and nanodevices.Of interest to device engineers, physicists, and semiconductor and solid state scientists in general.