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Nota di contenuto	<p>Ultrafast Lasers Based on Quantum Dot Structures: Physics and Devices; Contents; Introduction; Acknowledgments; 1 Semiconductor Quantum Dots for Ultrafast Optoelectronics; 1.1 The Role of Dimensionality in Semiconductor Materials; 1.2 Material Systems Used; 1.2.1 III-V Epitaxially Grown Quantum Dots; 1.2.2 QD-Doped Glasses; 1.2.3 Quantum Dashes; 1.3 Quantum Dots: Distinctive Properties for Ultrafast Devices; 1.3.1 Inhomogeneous Broadening; 1.3.2 Ultrafast Carrier Dynamics; 2 Foundations of Quantum Dot Theory; 2.1 Energy Structure and Matrix Elements</p> <p>2.2 Theoretical Approaches to Calculating Absorption and Gain in Quantum Dots 2.3 Kinetic Theory of Quantum Dots; 2.4 Light-Matter Interactions in Quantum Dots; 2.5 The Nonlinearity Coefficient; 3 Quantum Dots in Amplifiers of Ultrashort Pulses; 3.1 Optical Amplifiers for High-Speed Applications: Requirements and Problems; 3.2 Quantum Dot Optical Amplifiers: Short-Pulse Operating Regime; 3.3 Quantum Dot Optical Amplifiers at High Bit Rates: Low Distortions and Patterning-Free Operation; 3.4 Nonlinear Operation and Limiting Function Using QD Optical Amplifiers; 4 Quantum Dot Saturable Absorbers</p> <p>4.1 Foundations of Saturable Absorber Operation 4.2 The General Physical Principles of Saturable Absorption in Semiconductors; 4.2.1 Physical Processes in a Saturable Absorber; 4.2.2 Geometry of Saturable Absorber: SESAM versus Waveguide Absorber - The Cavity Enhancement of Saturable Absorption and the Standing Wave Factor in SESAMs; 4.3 The Main Special Features of a Quantum Dot Saturable Absorber Operation; 4.3.1 Bandwidth of QD SAs; 4.3.2 Dynamics of Carrier Relaxation: Ultrafast Recovery of Absorption; 4.3.3 Saturation Fluence; 5 Monolithic Quantum Dot Mode-Locked Lasers</p> <p>5.1 Introduction to Semiconductor Mode-Locked Lasers 5.1.1 Place of Semiconductor Mode-Locked Lasers Among Other Ultrashort Pulse Sources; 5.1.2 Mode-Locking Techniques in Laser Diodes: The Main Principles; 5.1.3 Passive Mode Locking: The Qualitative Picture, Physics, and Devices; 5.2 Theoretical Models of Mode Locking in Semiconductor Lasers; 5.2.1 Small-Signal Time Domain Models: Self-Consistent Pulse Profile; 5.2.2 Large-Signal Time Domain Approach: Delay Differential Equations Model; 5.2.3 Traveling Wave Models</p> <p>5.2.4 Frequency and Time-Frequency Treatment of Mode Locking: Dynamic Modal Analysis 5.3 Main Predictions of Generic Mode-Locked Laser Models and their Implication for Quantum Dot Lasers; 5.3.1 Laser Performance Depending on the Operating Point; 5.3.2 Main Parameters that Affect Mode-Locked Laser Behavior; 5.4 Specific Features of Quantum Dot Mode-Locked Lasers in Theory and Modeling; 5.4.1 Delay Differential Equation Model for Quantum Dot Mode-Locked Lasers; 5.4.2 Traveling Wave Modeling of Quantum Dot Mode-Locked Lasers: Effects of Multiple Levels and Inhomogeneous Broadening</p> <p>5.4.3 Modal Analysis for QD Mode-Locked Lasers</p>
Sommario/riassunto	<p>In this monograph, the authors address the physics and engineering together with the latest achievements of efficient and compact ultrafast lasers based on novel quantum-dot structures and devices. Their approach encompasses a broad range of laser systems, while taking into consideration not only the physical and experimental aspects but</p>

also the much needed modeling tools, thus providing a holistic understanding of this hot topic.
