1. Record Nr. UNINA9910146406803321

Autore	Kannatey-Asibu E
Titolo	Principles of laser materials processing [[electronic resource] /] / Elijah Kannatey-Asibu, Jr
Pubbl/distr/stampa	Hoboken, N.J., : Wiley, c2009
ISBN	1-282-11388-7 9786612113888 0-470-45930-1 0-470-45919-0
Descrizione fisica	1 online resource (849 p.)
Collana	Wiley series on processing of engineering materials
Disciplina	621.36/6 621.366
Soggetti	Lasers - Industrial applications Materials science Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	PRINCIPLES OF LASER MATERIALS PROCESSING; CONTENTS; PREFACE; PART I PRINCIPLES OF INDUSTRIAL LASERS; 1 Laser Generation; 1.1 Basic Atomic Structure; 1.2 Atomic Transitions; 1.2.1 Selection Rules; 1.2.2 Population Distribution; 1.2.3 Absorption; 1.2.4 Spontaneous Emission; 1.2.5 Stimulated Emission; 1.2.6 Einstein Coefficients: Ae,B (12),B(21); 1.3 Lifetime; 1.4 Optical Absorption; 1.5 Population Inversion; 1.6 Threshold Gain; 1.7 Two-Photon Absorption; 1.8 Summary; References; Appendix 1A; Problems; 2 Optical Resonators; 2.1 Standing Waves in a Rectangular Cavity; 2.2 Planar Resonators 2.2.1 Beam Modes2.2.1.1 Longitudinal Modes; 2.2.1.2 Transverse Modes; 2.2.2 Line Selection; 2.2.3 Mode Selection; 2.2.3.1 Transverse Mode Selection; 2.2.3.2 Longitudinal Mode Selection; 2.3 Confocal Resonators; 2.4 Generalized Spherical Resonators; 2.5 Concentric Resonators; 2.6 Stability of Optical Resonators; 2.7 Summary; Appendix 2A; Problems; 3 Laser Pumping; 3.1 Optical Pumping; 3.1.1 Arc or Flash Lamp Pumping; 3.1.2 Diode Laser Pumping; 3.1.2.1 Longitudinal Pumping; 3.1.2.2 Transverse Pumping; 3.1.3 Pumping Efficiency; 3.1.4

Energy Distribution in the Active Medium

3.2 Electrical Pumping3.3 Summary; 4 Rate Equations; 4.1 Two-Level System; 4.2 Three-Level System; 4.3 Four-Level System; 4.4 Summary; Appendix 4A; Problems; 5 Broadening Mechanisms; 5.1 Line-Shape Function; 5.2 Line-Broadening Mechanisms; 5.2.1 Homogeneous Broadening; 5.2.1.1 Natural Broadening; 5.2.1.2 Collision Broadening; 5.2.2 Inhomogeneous Broadening; 5.3 Comparison of Individual Mechanisms; 5.4 Summary; Appendix 5A; Problems; 6 Beam Modification; 6.1 Quality Factor; 6.2 Q-Switching; 6.2.1 Mechanical Shutters; 6.2.2 Electro-Optic Shutters; 6.2.3 Acousto-Optic Shutters 6.2.4 Passive Shutters6.3 Q-Switching Theory; 6.4 Mode-Locking; 6.4.1 Active Mode Locking; 6.4.2 Passive Mode-Locking; 6.5 Laser Spiking; 6.6 Lamb Dip; 6.7 Summary; Appendix 6A; Problems; 7 Beam Characteristics; 7.1 Beam Divergence; 7.2 Monochromaticity; 7.3 Beam Coherence; 7.3.1 Spatial Coherence; 7.3.2 Temporal Coherence; 7.4 Intensity and Brightness; 7.5 Frequency Stabilization; 7.6 Beam Size; 7.7 Focusing; 7.8 Radiation Pressure; 7.9 Summary; References; Appendix 7A; Problems; 8 Types of Lasers; 8.1 Solid-State Lasers; 8.1.1 The Ruby Laser; 8.1.2 Neodymium Lasers; 8.1.2.1 The Nd:YAG Laser 8.1.2.2 The Nd:Glass Laser8.2 Gas Lasers; 8.2.1 Neutral Atom Lasers; 8.2.2 Ion Lasers; 8.2.3 Metal Vapor Lasers; 8.2.4 Molecular Gas Lasers; 8.2.4.1 Vibrational-Rotational Lasers; 8.2.4.2 Vibronic Lasers; 8.2.4.3 Excimer Lasers; 8.3 Dye Lasers; 8.4 Semiconductor (Diode) Lasers; 8.4.1 Semiconductor Background; 8.4.2 Semiconductor Lasers; 8.4.3 Semiconductor Laser Types; 8.4.3.1 Homojunction Lasers; 8.4.3.2 Heterojunction Lasers; 8.4.3.3 Quantum Well Lasers; 8.4.4 Low-Power Diode Lasers; 8.4.5 High-Power Diode Lasers; 8.4.6 Applications of High-Power Diode Lasers; 8.5 Free Electron Laser
8.6 New Developments in Industrial Laser Technology

Sommario/riassunto

Coverage of the most recent advancements and applications in laser materials processing This book provides state-of-the-art coverage of the field of laser materials processing, from fundamentals to applications to the latest research topics. The content is divided into three succinct parts: Principles of laser engineering-an introduction to the basic concepts and characteristics of lasers, design of their components, and beam delivery Engineering background&-a review of engineering concepts needed to analyze different processes: thermal analysis and fluid flow; solidification