

1. Record Nr.	UNINA9911004838403321
Autore	Kalisky Yehoshua Y
Titolo	The physics and engineering of solid state lasers / / Yehoshua Kalisky
Pubbl/distr/stampa	Bellingham, Wash., : SPIE Press, c2006
ISBN	9781615837021 1615837027 9780819480460 0819480460
Descrizione fisica	1 online resource (222 p.)
Collana	Tutorial texts in optical engineering ; ; v. TT 71
Disciplina	621.36/61
Soggetti	Solid-state lasers
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	List of abbreviations -- Preface -- Chapter 1. Introduction -- 1.1. Historical background. 1.1.1. Early developments; 1.1.2. Technological developments -- 1.2. Laser materials. 1.2.1. Elements of a typical laser oscillator; 1.2.2. Optics -- References -- Chapter 2. Solid state laser materials -- 2.1. Properties. 2.1.1. Optics; 2.1.2. Material design; 2.1.3. Mechanical design -- 2.2. Doping ions. 2.2.1. Laser host materials -- 2.3. General properties of hosts; 2.3.1. Optical properties; 2.3.2. Chemical properties; 2.3.3. Mechanical properties; 2.3.4. Thermal properties -- References -- Chapter 3. Structure and bonding of solids -- 3.1. Crystal structure. 3.1.1. Types of crystals -- 3.2. Crystal binding. 3.2.1. Van der Waals interaction; 3.2.2. Ionic bonding; 3.2.3. Covalent bonding -- References. Chapter 4. Garnet crystals as laser hosts -- 4.1. Physical characteristics of garnets and mixed garnets -- 4.2. Chromium- and neodymium-doped garnets -- 4.3. Disordered (mixed) garnets -- 4.4. Glass and crystalline ceramics -- References -- Chapter 5. Fluoride laser crystals: YLiF ₄ (YLF) -- 5.1. Thermal and mechanical properties of YLF -- 5.1.1. Estimate of thermal load at fracture -- 5.2. Nonradiative losses in YLF -- 5.3. Neodymium-doped YLF -- 5.4. Holmium-doped YLF -- 5.5. Thulium-doped YLF -- 5.6. Other fluoride crystals -- 5.7. Cascade emission -- 5.8. Upconversion -- 5.8.1. Applications to upconversion

-- References -- Chapter 6. Photophysics of solid state laser materials -- 6.1. Properties of the lasing ion. 6.1.1. Absorption; 6.1.2. Spontaneous emission; 6.1.3. Stimulated emission; 6.1.4. Oscillator strength -- 6.2. Nonradiative transition. 6.2.1. Energy gap and temperature dependence of multiphonon relaxation; 6.2.2. Temperature dependence of nonradiative relaxation -- References. Chapter 7. Energy transfer -- 7.1. Introduction -- 7.2. Radiative energy transfer -- 7.3. Nonradiative energy transfer. 7.3.1. Basic mechanisms of energy transfer -- References -- Chapter 8. Lasing efficiency and sensitization -- 8.1. Introduction -- 8.2. Why is energy transfer needed? 8.2.1. Examples of CTH-doped systems -- 8.3. Temperature effects -- 8.4. The effect of Tm^{3+} concentration -- 8.5. The effect of Cr^{3+} concentration -- 8.6. Nature of ionic interaction. 8.6.1. Cr-Tm interaction; 8.6.2. Tm-Tm interaction; 8.6.3. Tm-Ho interaction; 8.6.4. Ho-Tm back interaction; 8.6.5. Selective energy transfer -- References. Chapter 9. Two-micron lasers: holmium- and thulium-doped crystals -- 9.1. Introduction -- 9.2. Advantages of the holmium laser. 9.2.1. Utilizing energy transfer -- 9.3. Conventional pumping. 9.3.1. CW laser operation; 9.3.2. Pulsed operation of holmium lasers -- 9.4. Diode pumping. 9.4.1. End-pumped 2- μm lasers; 9.4.2. Side-pumped 2- μm lasers -- References -- Chapter 10. Yb:YAG Laser -- 10.1. Introduction -- 10.2. End-pumping -- 10.3. Side-pumping -- 10.4. Face-pumping or thin disk configuration -- References -- Chapter 11. More on other crystals: fluorides and vanadates -- 11.1. Introduction -- 11.2. Laser crystals: YLF ($YLiF_4$) and YVO_4 -- 11.3. Pumping schemes. 11.3.1. Diode end-pumping of Nd:YLF; 11.3.2. Side-pumping of Nd:YLF -- 11.4. Diode end-pumping of Nd:YVO₄ and Nd:GdVO₄ -- 11.4.1. Advantages and disadvantages of vanadate crystals; 11.4.2. Q-switching and mode-locking operation -- References -- Appendix: Diode-pumped solid state lasers -- A.1. Introduction -- A.2. Advantages of diode-pumping -- A.3. Pumping schemes -- A.4. Longitudinal pumping -- A.5. Transverse pumping -- A.6. Types of diodes -- A.7. Temperature control -- References -- Index.

Sommario/riassunto

This text explains the mutual influences between the physical and dynamic processes in solids and their lasing properties. It provides insight into the physics and engineering of solid state lasers by integrating information from several disciplines, including solid state physics, materials science, photophysics, and dynamic processes in solids. The text discusses approaches to developing new laser materials and includes data tables of basic parameters that can be applied to laser design. Novel materials and techniques used in recent developments are also covered.