1. Record Nr. UNINA9910136781803321

Autore	Obayya Salah
Titolo	Computational liquid crystal photonics : fundamentals, modelling and applications / / Salah Obayya, Mohamed Farhat O. Hameed and Nihal F. F. Areed
Pubbl/distr/stampa	Chichester, England : , : Wiley, , 2016 ©2016
ISBN	1-119-04198-8 1-119-04200-3
Descrizione fisica	1 online resource (283 p.)
Classificazione	TEC008000
Disciplina	621.3815422
Soggetti	Liquid crystal devices - Mathematical models Integrated optics - Mathematics Photonics - Mathematics
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 at the end of each chapters and index.
Nota di contenuto	Title Page; Copyright Page; Contents; Preface; Part I Basic Principles; Chapter 1 Principles of Waveguides; 1.1 Introduction; 1.2 Basic Optical Waveguides; 1.3 Maxwell's Equations; 1.4 The Wave Equation and Its Solutions; 1.5 Boundary Conditions; 1.6 Phase and Group Velocity; 1.6.1 Phase Velocity; 1.6.2 Group Velocity; 1.7 Modes in Planar Optical Waveguide; 1.7.1 Radiation Modes; 1.7.2 Confinement Modes; 1.8 Dispersion in Planar Waveguide; 1.8.1 Intermodal Dispersion; 1.8.2 Intramodal Dispersion; 1.9 Summary; References; Chapter 2 Fundamentals of Photonic Crystals; 2.1 Introduction 2.2 Types of PhCs2.2.1 1D PhCs; 2.2.2 2D PhCs; 2.2.3 3D PhCs; 2.3 Photonic Band Calculations; 2.3.1 Maxwell's Equations and the PhC; 2.3.2 Floquet-Bloch Theorem, Reciprocal Lattice, and Brillouin Zones; 2.3.3 Plane Wave Expansion Method; 2.3.4 FDTD Method; 2.3.5 Photonic Band for Square Lattice; 2.4 Defects in PhCs; 2.5 Fabrication Techniques of PhCs; 2.5.1 Electron-Beam Lithography; 2.5.2 Interference Lithography; 2.5.3 Nano-Imprint Lithography; 2.5.4 Colloidal Self-Assembly; 2.6 Applications of PhCs; 2.7 Photonic Crystal Fiber; 2.7.1 Construction; 2.7.2 Modes of Operation

2.7.3 Fabrication of PCF2.7.4 Applications of PCF; 2.8 Summary; References; Chapter 3 Fundamentals of Liquid Crystals; 3.1 Introduction; 3.2 Molecular Structure and Chemical Composition of an LC Cell; 3.3 LC Phases; 3.3.1 Thermotropic LCs; 3.3.2 Lyotropic LCs; 3.3.3 Metallotropic LCs; 3.4 LC Physical Properties in External Fields; 3.4.1 Electric Field Effect; 3.4.2 Magnetic Field Effect; 3.5 Theortitcal Tratment of LC; 3.5.1 LC Parameters; 3.5.2 LC Models; 3.6 LC Sample Preparation; 3.7 LCs for Display Applications; 3.8 LC Thermometers; 3.9 Optical Imaging
3.10 LC into Fiber Optics and LC Planar Photonic Crystal3.11 LC Solar Cell; References; Part II Numerical Techniques; Chapter 4 Full-Vectorial Finite-Difference Method; 4.1 Introduction; 4.2 Overview of Modeling Methods; 4.3 Formulation of the FVFDM; 4.3.1 Maxwell's Equations; 4.3.2 Wave Equation; 4.3.3 Boundary Conditions; 4.3.4 Maxwell's Equations in Complex Coordinate; 4.3.5 Matrix Solution; 4.4 Summary; References; Chapter 5 Assessment of the Full-Vectorial Finite-Difference Method; 5.1 Introduction; 5.2 Overview of the LC-PCF; 5.3 Soft Glass; 5.4 Design of Soft Glass PCF with LC Core
5.5 Numerical Results5.5.1 FVFDM Validation; 5.5.2 Modal Hybridness; 5.5.3 Effective Index; 5.5.4 Effective Mode Area; 5.5.5 Nonlinearity; 5.5.6 Birefringence; 5.5.7 Effect of the NLC Rotation Angle; 5.5.8 Effect of the Temperature; 5.5.9 Elliptical SGLC-PCF; 5.6 Experimental Results of LC-PCF; 5.6.1 Filling Temperature; 5.6.2 Filling Time; 5.7 Summary; References; Chapter 6 Full-Vectorial Beam Propagation Method; 6.1 Introduction; 6.2 Overview of the BPMs; 6.3 Formulation of the FV-BPM; 6.3.1 Slowly Varying Envelope Approximation; 6.3.2 Paraxial and Wide-Angle Approximation
6.4 Numerical Assessment

Sommario/riassunto

"Optical computers and photonic integrated circuits in high capacity optical networks are hot topics, attracting the attention of expert researchers and commercial technology companies. Optical packet switching and routing technologies promise to provide a more efficient source of power, and footprint scaling with increased router capacity; integrating more optical processing elements into the same chip to increase on-chip processing capability and system intelligence has become a priority. This book is an in-depth look at modelling techniques and the simulation of a wide range of liquid crystal based modern photonic devices with enhanced high levels of flexible integration and enhanced power processing. It covers the physics of liquid crystal materials; techniques required for modelling liquid crystal based devices; the state-of-the art liquid crystal photonic based applications for telecommunications such as couplers, polarization rotators, polarization splitters and multiplexer-demultiplexers; liquid core photonic crystal fiber (LC-PCF) sensors including biomedical and temperature sensors; and liquid crystal photonic crystal based encryption systems for security applications. Key features Offers a unique source of in-depth learning on the fundamental principles of computational liquid crystal photonics. Explains complex concepts such as photonic crystals, liquid crystals, waveguides and modes, and frequency- and time-domain techniques used in the design of liquid crystal photonic crystal photonic devices in terms that are easy to understand. Demonstrates the useful properties of liquid crystals in a diverse and ever-growing list of technological applications. Requires only a foundational knowledge of mathematics and physics. "--