

1. Record Nr.	UNINA9911019222103321
Autore	Varadan V. K. <1943->
Titolo	Smart material systems and MEMS : design and development methodologies // Vijay K. Varadan, K.J. Vinoy, S. Gopalakrishnan
Pubbl/distr/stampa	Chichester, England ; ; Hoboken, NJ, : John Wiley & Sons, c2006
ISBN	9786610721702 9781280721700 1280721707 9780470093634 0470093633 9780470093627 0470093625
Descrizione fisica	1 online resource (420 p.)
Altri autori (Persone)	VinoyK. J <1969-> (Kalarickaparambil Joseph) GopalakrishnanS (Srinivasan)
Disciplina	621.381
Soggetti	Microelectromechanical systems Smart materials
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	Smart Material Systems and MEMS; Contents; Preface; About the Authors; Part 1: Fundamentals; 1 Introduction to Smart Systems; 1.1 Components of a smart system; 1.1.1 'Smartness'; 1.1.2 Sensors, actuators, transducers; 1.1.3 Micro electromechanical systems (MEMS); 1.1.4 Control algorithms; 1.1.5 Modeling approaches; 1.1.6 Effects of scaling; 1.1.7 Optimization schemes; 1.2 Evolution of smart materials and structures; 1.3 Application areas for smart systems; 1.4 Organization of the book; References; 2 Processing of Smart Materials; 2.1 Introduction; 2.2 Semiconductors and their processing 2.2.1 Silicon crystal growth from the melt 2.2.2 Epitaxial growth of semiconductors; 2.3 Metals and metallization techniques; 2.4 Ceramics; 2.4.1 Bulk ceramics; 2.4.2 Thick films; 2.4.3 Thin films; 2.5 Silicon micromachining techniques; 2.6 Polymers and their synthesis; 2.6.1 Classification of polymers; 2.6.2 Methods of polymerization; 2.7 UV radiation curing of polymers; 2.7.1 Relationship between

wavelength and radiation energy; 2.7.2 Mechanisms of UV curing; 2.7.3 Basic kinetics of photopolymerization; 2.8 Deposition techniques for polymer thin films

2.9 Properties and synthesis of carbon nanotubesReferences; Part 2: Design Principles; 3 Sensors for Smart Systems; 3.1 Introduction; 3.2 Conductometric sensors; 3.3 Capacitive sensors; 3.4 Piezoelectric sensors; 3.5 Magnetostrictive sensors; 3.6 Piezoresistive sensors; 3.7 Optical sensors; 3.8 Resonant sensors; 3.9 Semiconductor-based sensors; 3.10 Acoustic sensors; 3.11 Polymeric sensors; 3.12 Carbon nanotube sensors; References; 4 Actuators for Smart Systems; 4.1 Introduction; 4.2 Electrostatic transducers; 4.3 Electromagnetic transducers; 4.4 Electrodynamic transducers

4.5 Piezoelectric transducers4.6 Electrostrictive transducers; 4.7 Magnetostrictive transducers; 4.8 Electrothermal actuators; 4.9 Comparison of actuation schemes; References; 5 Design Examples for Sensors and Actuators; 5.1 Introduction; 5.2 Piezoelectric sensors; 5.3 MEMS IDT-based accelerometers; 5.4 Fiber-optic gyroscopes; 5.5 Piezoresistive pressure sensors; 5.6 SAW-based wireless strain sensors; 5.7 SAW-based chemical sensors; 5.8 Microfluidic systems; References; Part 3: Modeling Techniques; 6 Introductory Concepts in Modeling; 6.1 Introduction to the theory of elasticity

6.1.1 Description of motion6.1.2 Strain; 6.1.3 Strain-displacement relationship; 6.1.4 Governing equations of motion; 6.1.5 Constitutive relations; 6.1.6 Solution procedures in the linear theory of elasticity; 6.1.7 Plane problems in elasticity; 6.2 Theory of laminated composites; 6.2.1 Introduction; 6.2.2 Micromechanical analysis of a lamina; 6.2.3 Stress-strain relations for a lamina; 6.2.4 Analysis of a laminate; 6.3 Introduction to wave propagation in structures; 6.3.1 Fourier analysis; 6.3.2 Wave characteristics in 1-D waveguides; References; 7 Introduction to the Finite Element Method

7.1 Introduction

---

## Sommario/riassunto

Presenting unified coverage of the design and modeling of smart micro- and macrosystems, this book addresses fabrication issues and outlines the challenges faced by engineers working with smart sensors in a variety of applications. Part I deals with the fundamental concepts of a typical smart system and its constituent components. Preliminary fabrication and characterization concepts are introduced before design principles are discussed in detail. Part III presents a comprehensive account of the modeling of smart systems, smart sensors and actuators. Part IV builds upon the fundamental conce

---