1. Record Nr. UNINA9910830936703321

Autore	Dahoo Pierre Richard
Titolo	Nanometer-scale defect detection using polarized light / / Pierre Richard Dahoo, Philippe Pougnet, Abdelkhalak El Hami
Pubbl/distr/stampa	London, England ; ; Hoboken, New Jersey : , : ISTE : , : Wiley, , 2016 ©2016
ISBN	1-119-32963-9 1-119-32965-5
Descrizione fisica	1 online resource (320 pages) : illustrations
Collana	Mechanical Engineering and Solid Mechanics Series Reliability of multiphysical systems set ; ; Volume 2
Disciplina	620.115
Soggetti	Nanostructured materials
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Cover; Title Page; Copyright ; Contents; Preface; 1. Uncertainties; 1.1. Introduction; 1.2. The reliability based design approach; 1.2.1. The MC method; 1.2.2. The perturbation method; 1.2.3. The polynomial chaos method; 1.3. The design of experiments method; 1.3.1. Principle; 1.3.2. The Taguchi method; 1.4. The set approach; 1.4.1. The method of intervals; 1.4.2. Fuzzy logic based method; 1.5. Principal component analysis; 1.5.1. Description of the process; 1.5.2. Mathematical roots; 1.5.3. Interpretation of results; 1.6. Conclusions; 2. Reliability-based Design Optimization 2.1. Introduction2.2. Deterministic design optimization; 2.3. Reliability analysis; 2.3.1. Optimal conditions; 2.4. Reliability-based design optimization; 2.4.1. The objective function; 2.4.2. Total cost consideration; 2.4.3. The design variables; 2.4.4. Response of a system by RBDO; 2.4.5. Limit states; 2.4.6. Solution techniques; 2.5. Application: optimization of materials of an electronic circuit board; 2.5.1. Optimization problem; 2.5.2. Optimization and uncertainties; 2.5.3. Results analysis; 2.6. Conclusions; 3. The Wave-Particle Nature of Light; 3.1. Introduction 3.2. The optical wave theory of light according to Huyghens and Fresnel3.2.1. The three postulates of wave optics; 3.2.2. Luminous power and energy; 3.2.3. The monochromatic wave; 3.3. The

electromagnetic wave according to Maxwell's theory; 3.3.1. The Maxwell equations; 3.3.2. The wave equation according to the Coulomb's gauge; 3.3.3. The wave equation according to the Lorenz's gauge; 3.4. The quantum theory of light; 3.4.1. The annihilation and creation operators of the harmonic oscillator; 3.4.2. The quantization of the electromagnetic field and the potential vector
3.4.3. Field modes in the second quantization4. The Polarization States of Light; 4.1. Introduction; 4.2. The polarization of light by the matrix method; 4.2.1. The Jones representation of polarization; 4.2.2. The Stokes and Muller representation of polarization; 4.3. Other methods to represent polarization; 4.3.1. The Poincare description of polarization; 4.3.2. The quantum description of polarization; 4.4. Conclusions; 5. Interaction of Light and Matter; 5.1. Introduction; 5.2. Classical models; 5.2.1. The Drude model; 5.2.2. The Sellmeir and Lorentz models
5.3. Quantum models for light and matter5.3.1. The quantum description of matter; 5.3.2. Jaynes-Cummings model; 5.4. Semiclassical models; 5.4.1. Tauc-Lorentz model; 5.4.2. Cody-Lorentz model; 5.5. Conclusions; 6. Experimentation and Theoretical Models; 6.1. Introduction; 6.2. The laser source of polarized light; 6.2.1. Principle of operation of a laser; 6.2.2. The specificities of light from a laser; 6.3. Laser-induced fluorescence; 6.3.1. Principle of the method; 6.3.2. Description of the experimental setup; 6.4. The DR method; 6.4.1. Principle of the method
Defects in a heterogeneous medium -- Defects at the interfaces -- Application to nanomaterials.

Sommario/riassunto

This book describes experimental and theoretical methods that are implemented within the framework of fundamental research to better understand physical and chemical processes at the nanoscale that are responsible for the remarkable properties of materials used in innovative technological devices. It presents optical techniques based on polarized light allowing the characterization of defects in materials or in their interfaces that are likely to impact performance. It also describes ways of knowing mechanical properties of nanomaterials by using theoretical models and analysis of experimental results and their uncertainties.