CHAPTER 15

ELECTRONIC SCIENCE

Doctoral Theses

158. ANEJA (Anamika)
Development of a Conducting Polymer Based Sensor for Medical Diagnostics Using FRET.
Supervisor : Prof. P. K. Bhatnagar
Th 16321

Abstract

The test of DNA sequence using FRET is sensitive because of polymer. The ability of the polymer to absorb and emit a photon relative to the ability of small fluorescent molecule attached to PNA is huge and that is what we call 'optical amplification'. The method is simple, elegant, sensitive and also economical as it decrease the cost of diagnostics. Mutation studies is known ssDNA sequence for 'Bacillus Anthracis' has also been demonstrated using the same technique. Studies triFRET system, which is an extension of conventional FRT, Consisting of three components.

Contents

159. JAIN (Geetika)
Design Considerations For Lithium Niobate Optical Waveguides and Erbium Doped Waveguide Amplifiers.
Supervisor : Prof. Enakshi Khular Sharma
Th 16323

Abstract

Gives a comprehensive study of diffused channel waveguides, specifically the design considerations for Titanium indiffused

Lithium Niobate channel optical waveguides. Also developed the simplified analysis for gain calculations of Erbium doped waveguide amplifiers. Studies the effect of varying signal power, pump powers and waveguide lentgh on the gain spectrum.

Contents

1. Introduction. 2.Characteristics of titanium in-diffused $LiNbO_3$ waveguides. 3. Closed form field expressions for Titanium-diffused $LiNbo_3$ channel waveguides. 4. Synthesis of Titanium indiffused $LiNbo_3$ waveguides with desired model fields. 5. Gain calculation in 1484nm pumped ernium doped $LiNbO_3$ channel waveguides. 6. Gain calculation in 1484nm pumped erbium doped $LiNbO_3$ channel waveguides for DWDM application. 7. Scope for future work. Bibliography.

160. KHANDELWAL (Rakhi)
Study of Structural and morphological Properties of Pulsed laser Deposited undoped Metal Oxide Thin Films and Theoretical Analysis for the Optimized Conditions.
Supervisor : Prof. Avinashi Kapoor
Th 16324

Abstract

Reports deposition of good crystalline ZnO films at a substrante temprature of 150 ^{0}C and polycrystalline SnO_2 films at 400 ^{0}C on Si (100) substrate using excimer laser at a fluence of 10 J/cm^2. Films have been deposited on Si (100) substrate at different substrate temperatures (25 ^{0}C, 150 ^{0}C, 300 ^{0}C and 400 ^{0}C) in O_2 gas ambient (10 Pa) and fluence of 10 J/cm^2. Si is used as a substrate, because it is the material of choice for integrated circuits and low power semiconductor electronic devices for the past 50 years.

Contents

1. Introduction. 2. Experimental : deposition, characterization and measurements. 3. Structural and morphological properties of undoped zinc oxide films. 4. Structural and morphological properties of undoped tin oxide films. 5. Theoretical analyses of the optimization of parameters for zinc oxide using pulsed laser deposition. Conclusion and future work.

161. KUMAR (SONA P)

Analysis Modeling and Simulation of AIGaN/GaN Modulation Doped Field Effect Transistor.

Supervisor : Dr. Mridula Gupta and Dr. Anju Agrawal

Th 16316

Abstract

Focuses on developing physics based models for performance prediction of conventional, small geometry and dual material gate HEMTs and varifying these models through the device simulations carried out using ATLAS device simulator. The analysis relates the device performance to various important device and material parameters and provides a deep insight into device physics. Simulation study has been extended to predict the on-state performance along with linearity distortion performance to propose the appliction of AIGaN/GaN HEMT for low noise, high linearity applications. The result of the present research will make it possible to use AIGaN/GaN HEMTs for a number of military systems for readers and commercial telecommunications systems.

Contents

162. RAM GOPAL SINGH

Modification of Structural Optical and Photoluminescence properties of ZnOporous Silicon Nanocomposites Using Shi Irradiation.

Supervisors : Prof. R. M. Mehra and Prof. E. K. Sharma

Th 16326

Abstract

Presents the synthesis of ZnO-PS nanocomposites by simple route of sol-gel route and electron gun evaporation. The studies

are further carried out to optimize or controlled the properties of the nanocomposites by thermal and arthermal (ion irradiation) processes for potential applications. Optical absorption and band-gap obtained by UV-Visible spectrophotometer, the luminescence properties and electron transport properties are also investigated. When ion beam passes through the material, it decelerates via two processes; by the elastic scattering by interacting with the electronic subsystem of materials known as electronic energy loss. Nuclear energy loss is dominant at low energy (`keV/nucleon) while electronic energy loss is dominant at high energy (` MeV/nucleon). The specific features of the SHI like controlled defect creation, reproducibility, spatial selectivity and processing at relatively low tempratures are investigated.

Contents

1. Introduction. 2. Synthesis and modification techniques. 3. Characterization techniques. 4. Modification ZnO-Porous silicon nanocomposites : Annealing studies. 5. Modification of ZnO - Porous silicon nanocomposites : Shi irradiation studies. 6. Development of solid state white light emitting source. 7. Summary and future scope.

163. SEEMA RANI

Fabrication and Characterization of Quasi Solid and Solid State Dye Sensitized Solar Cells.

Supervisors : Prof. R. M. Mehra and Dr. P. K. Shishodia

Th 16322

Abstract

Fabricates and characterize quasi solid and solid state DSSCs. In a solid state DSSC, the liquid electrolyte is replaced by a solid state charge transport material. The replacement of the electrolyte with a solid state charge carrier is advantageous when it comes to long term stability of the volatile liquid electrolyte. Illustrates different techniques to improve the photovoltaic performance of quasi solid state DSSCs. ZnO nanoparticles have been investigated due to their dye adsorption in cell structure. The use of multiwall carbon nanotubes (MWCNTs) in electrolyte has been made to improve the photovoltaic performance of solid state DSSCs. The growth mechanism of sol-gel derives nanocrystalline ZnO powder has been discussed. The influence of pH value of the sol on the crystallite size, morphology and structure of ZnO powder has

been investigated and maximum size nanocrystallite (~14 nm) of ZnO powder is obtained for the ~9 pH. Dye sensitized solar cell made of ZnO powder grown with 9 pH shows the best photovoltaic performance.

Contents

1. Introduction. 2. Experimental details. 3.Synthesis of nanocrystalline ZnO powder. 4. Solid state DSSCs using composite electrilyte of poly(3-hexylthiophene-2,5-diyl) and carbon nano tubes. 5. Quasi solid state DSSCs with dispersed hole conducting material. 6. Dye with broadband absorbance in visible spectrum. 7. Conclusion.

164. SHARMA (Mamta)
Study of Co and A1 Doped Sol-Gel Derived ZnO Films For Dilute Magnetic Semiconductor Application.
Supervisor : Prof. R. M. Mehra
Th 16318

Abstract

Focuses on the development and characterization of ZnO based dilute magnetic semiconductor films exhibiting magnetic properties at room temprature. High quality transparent, conducting and magnetic Co and Al codoped n-type ZnO (ZCAO) films have been prepared by sol-gel process by spin coating. Studies of stabilizer (MEA) on sol pH, sol stability, structural, electrical and optical properties of ZCAO films. Effect of Co concentration and annealing temprature on the structural, electrical, optical and magnetic properties of ZCAO films. Effect of film thickness on the structural, electrical, optical and megnaetic properties of ZCAO films.

Contents

1. Introduction. 2. Sol-Gel process, characterization and measurement techniques. 3. Microstructure and surface morphology of Co and Al codoped ZnO films. 4. Electrical and optical properties of Co and Al codoped ZnO Films. 5. Magnetic properties of Co and Al codoped ZnO films. 6. Conclusion.

165. SHARMA (Ruchika)
Development and Characterisation of Doped ZnO Films Transparent Conducting Window Application.
Supervisor : Prof. R. M. Mehra
Th 16319

Abstract

Focuses on the deposition and characterization of sol-gel derived transparent and conducting scandium doped n-type ZnO films on corning (7059), p-Si (100) and c-plane sapphire substrates. The effect of film thickness, annealing temprature and dopant concentration on the structural, electrical and optical properties has been thoroughly investigated in order to optimize the deposition parameters. The increase in E_g with annealing temprature attributed to the increase in the crystallite size and the stress relieving process in ZnO:Sc films. E_g was found to increase from 3.295 to 3.305 eV as the dopant is increased from 0 - 1.0 wt%. The increase of E_g has been analysed using band gap windening due to Burstein-Moss effect. The highly conducting and transparent ZnO:Sc (0.5 wt%) films on corning glass substrate have potential to be used for TCO applications.

Contents

166. SHARMA (Rupendra Kumar)
Two Dimensional Analytical Modeling and Simulation of Gate Misalignment Effect in Fully Depleted Double Gate Mosfet.
Supervisor : Dr. Mridula Gupta
Th 16558

Abstract

Focuses on the effect of Gate misalignment in DG SOIn-MOSFET under both ON and OFF conditions and its possible solutions. The graded channel (GC) architectures have been presented for the first time as a solution for Gate misalignment. Further, the effect of Gate misalignment in nano scale dual material double gate (DMDG) SOI MOSFET has been analyzed. In this regards, analytical modeling and numerical simulations using ATLAS device simulation have been done.

Contents

1. Introduction. 2. Two-dimentional analytical subthreshold model of graded channel DG FD SOI n-MOSFET with gate misalignment effect. 3. Graded channel architecture : The solution for misaligned DG FD SOI n-MOSFET. 4. Dynamic performance of graded channel DG FD SOI n-MOSFETs for minimizing the gate misalignment effect. 5. Dual material double gate SOI n-MOSFET : Gate misalignment analysis. 6. Conclusion and future scope. Bibliography.

167. SHARMA (Sandeep)
Theoretical Investigation of Transient Analysis of First and Second Order Loads Powered by PV Generators.
Supervisor : Prof. Avinashi Kapoor
Th 16325

Abstract

Deals with the theoretical investigation of transient of first and second order loads driven by photovoltaic generators. The current-voltage equation of a solar cell is transcendental in nature. Till now several numerical and iterative techniques have been used to extract various parameters of solar cell. The parameter thus extracted are not accurate and the methods used require comparatively more computational time. The present work utilized a lesser known but efficient function called lambert W-function to separate current and voltage in solar cell equation. Parameters extracted using Lambert W-function are accurate and the methods used need less computational time. The work is used to derive array parameters. Further, transient analysis of first & second order loads driven by photovoltaic generators has been performed. For the transient analysis of first & second order loads driven by photovoltaic generators till now techniques used for such analysis were based on models that used either only series or shunt losses. This work uses the equivalent model constituting both series and shunt losses.

Contents

1. Introduction. 2. Literature review. 3. analysis of solar cell using lambert w-function. 4. Transient analysis - first order circuit. 5. Transient analysis - first order circuit. 6. Conclusion and scope of future work.

168. SRIVASTAVA(Piyush Kumar)
Fabrication and Characterisation of Nanostructured Yttrium doped Zinc Oxide Thin Films Prepared by Pulsed Laser Deposition Method.
Supervisor : Prof. Avinashi Kapoor
Th 16317

Abstract

Deals with the deposition of Yttrium doped ZnO thin films by pulsed laser deposition technique. The films were doped with Yttrium, a rare earth metal. The film is deposited at different substrate tempratures. The effect of doping and substrate temprature on the structural, morphological, optical and electrical properties of the film has been studied. For structural and morphological properties photoluminescene, FTIR and Ellipsometry measurements. Electrical measurements were performed with the help of Van der pauw method. Van der pauw technique focuses on Hall effects, which gives resistivity, carrier concentration and mobility of carriers.

Contents

169. VASHISTHA (POONAM)
Study of Propagation in Polymeric Optical Waveguides.
Supervisor : Prof. K. N. Tripathi
Th 16320

Abstract

Describes the different waveguide, materials i.e. polymer, photoresist and their applications in integrated optics; the definition of optical waveguide, classification of optical waveguide, basic three-layer optical waveguide structure, physical optic approach of the optical waveguide, ray optic approach and Eigen value equation for the TE and TM mode. Reports experimental studies, the fabrication and character-ization of methyl orange doped thin film K-Resin optical

waveguides. Studies the refractive index and propagation loss of ammonium dichromate doped poly (vinyl alcohol) thin films by using a prism coupling technique.

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