CHAPTER 13

ELECTRONIC SCIENCE

Doctoral Theses

147. GOEL (Kirti)
Two-Dimensional Analytical Modeling of Non-Uniformly Doped Dual Material Gate MOSFET and Triple Material Gate (TMG) MOSFET Structures.
Supervisor : Dr. Mridula Gupta
Th 15286

Abstract

Focuses on developing analytical models for gate workfunction engineered channel engineered MOSFETs with or without an oxide stack.

Contents

1. Introduction. 2. Modeling and simulation of dual material gate (DMG) epimosfet and dual material gate stack (DUMGAS) epi-mosfet. 3. Modeling and Simulation of dual-material asymmetric oxide (DMGASYMOX) stack mosfet and material gate stack (TRIMGAS) mosfet. 4. Modeling and simulation of hetero-material asymmetric gate stack EPI (HEMAGASE) and trimgas EPI mosfet. 5. Conclusion and future scope of work.

148. KUMAR (Neeru)
Growth and Analysis of n-ZnO/p-Si Heterostructures.
Supervisor : Prof. R. M. Mehra
Th 15287

Abstract

The focus of the present work is growth of heterostructures of sol-gel derived ZnO films on Si substrates. The heterostructures have been analyzed for their junction properties in dark and under illumination by performing current-voltage (I-V) and capacitance-voltage (C-V) measurements. The effect of Ytrium (Y) doping on the junction properties has also been studied. The

low temperature I-V measurements have been made to understand the transport phenomena of the heterostructures. A detailed investigation of optical properties in ZnO-a prerequisite to fabricate high-performance optoelectronic devices has been done through the analysis of the luminescence spectrum as a function of temperature.

Contents

1. Heterostructrures. 2. Experimental : Deposition, characterization and measurements. 3. Theoretical analysis of heterostructures. 4. Optical and photoluminescence studies of undoped and yttrium doped ZnO films. 5. I-V and C-V measuremetns and analysis of n-ZnO/P-Si heterostructures. 6. Conclusion.

149. MANGLA (Tina)
Modeling, Simulation and Characterization of Nano Scale MOSFETs with Quantum Mechanical Effects and Gate Stack Engineering for ULSI.
Supervisors : Prof. R. S. Gupta and Dr. Mridula Gupta
Th 15462

Abstract

The continuous downsizing of MOSFET (Metal-Oxide-Semiconductor-Field-Effect-Transistor) geometries is motivated by the need for high packing density and device speed together with low supply voltage operation for low-power ultra large scale integrated (ULSI) circuits. Because of their extremely small geometries, the design, fabrication and analysis of these MOSFETs involve a careful consideration and prediction of phenomenon required for the proper understanding of device physics at the submicrometer and nano scales, which in-turn forms the basic motivation towards this research work.

Contents

1. Introduction. 2. Quantum and classical approach : A comparison. 3. High-k and gate stack MOSFETS. 4. Two-diemnsional modeling with quantum mechanical effects. 5. Two-dimensional modeling with High-k and gate stack. 6. Conclusion and appendices.

150. SHARMA (Neha)
Study of Multilayer Polymeric Optical Waveguides for Optical Devices.
Supervisors : Prof. K. N. Tripathi and Dr. V. K. Sharma
Th 15288

Abstract

Presents the suitability of polymers for performance enhancement and cost effectiveness of multilayer optical waveguides. Deals with the mathematical overview of planar waveguides using Maxwell's equations, different polymer waveguide fabrication techniques like spin and dip coating along with characterization methods including prism coupling. Discusses the multilayer polarization filter based on polymers. Looks into application of polymers as mode filter. Deals with the removal and control of birefringence in optical waveguides. It proposes two different methods based on different assumptions.

Contents

1. Introduction to integrated optics. 2. Electromagnetic theory and characterization techniques of planar waveguide. 3. Multilayer polymeric polarization filters for integrated optics. 4. Multilayer polymeric mode filters for integrated optics. 5. Reduction and control of birefringence in planar waveguide using polymer layer. 6. Conclusion and future scope of the work.

151. SURI (Poonam)
Development and Characterization of Dye Sensitized Solar Cell Based on Zinc Oxide.
Supervisor : Prof. R. M. Mehra
Th 15290

Abstract

Investigates nanostructured ZnO as an alternative to TiO_2 in dye-sensitized solar cells. The main objective is to deposit ZnO films on transparent conducting oxide (TCO) which are sensitized with Eosin Y dye and to perform a systematic study of the fundamental propertieis of ZnO electrode. The properties of DSSC based on nanostructured ZnO are optimized with respect to doping, film thickness, dyeadsorption, electrolytes and their concentration. The effect of electrolytes on the solar cell parameters are investigated in terms of the size of cations and anions using impedance spectroscopy. The effect of intensity on DSSC has been studied. The experimental study is supported

by different spectroscopic and electrochemical techniques. An attempt has been made to study the charge recombination mechanism of the redox couples i.e. I^-/I_3^- and Br^-/Br_3^-. The performance of the solar cells has also been presented by determining the incident-light-to-current conversion efficiency (IPCE) at various wavelengths.

Contents