

CHAPTER 46

PHYSICS AND ASTROPHYSICS

Doctoral Theses

506. AGARWAL (Shivani)

Studies on Multiferroic Ceramics and Thin Films.

Supervisor : Prof. K. Sreenivas

Th 21144

Contents

1. Introduction to multiferroics and magnetoelectric composites 2. Statement of the problem and objectives of the thesis 3. Experimental techniques 4. Characterization of $[\text{BaTiO}_3]_{(1-x)} - [\text{CoFe}_2\text{O}_4]_x$ composites 5. Electrical and dielectric studies 6. Magnetoelectric effects in $[\text{BaTiO}_3]_{(1-x)} - [\text{CoFe}_2\text{O}_4]_x$ Bulk composites 7. $\text{BaTiO}_3 - \text{CoFe}_2\text{O}_4$ composite films by pulsed laser deposition 8. Conclusions and perspectives, scope of future work and references.

507. ARUN KUMAR

Search for the Standard Model Higgs Boson in the $H \rightarrow ZZ \rightarrow ee (\mu\mu) \nu\nu$ channel in the CMS Experiment at LHC

Supervisor : Dr. Kirti Ranjan

Th 21332

Contents

1. Introduction 2. Large hadron collider and the CMS experiment 3. Physics object reconstruction and identification at CMS 4. $H \rightarrow ZZ \rightarrow \ell\ell \nu_i \nu_i$ Analysis 5. $H \rightarrow ZZ \rightarrow \ell\ell \nu_i \nu_i$ analysis using multivariate technique 6. Summary and outlook. Appendices.

508. BATRA (Neha)

Development of Zinc Oxide Thin Film Based Biosensors for Cholesterol and Urea Detection.

Supervisor : Prof. Vinay Gupta

Th 21158

Contents

1. Introduction 2. Growth and characterization of ZnO thin films deposited by PLD 3. Biosensors based on PLD grown ZnO matrix 4. Sputtered Al:ZnO matrix for biosensors 5. ZnO nanostructured thin film grown by vapor phase transport 6. LDL immunosensors and reagentless cholesterol and urea 7. Scope for Future Work, References and Appendix.

509. DAWAR (Anit)
Fractals in Polymers
 Supervisor :Dr. Amita Chandra
Th 21146

Contents

1. Introduction 2. Experimental techniques 3. Fractal growth in ion conducting polymer matrix: Bias-free aggregation 4. Experimental evidence of theoretical simulations of fractal patterns in electric field 5. Fractal growth in low electric field 6. Conclusions and future work. Appendices.

510. DHAWAN (Sahil)
Quantum Confinement and Residual Stress Effects on Optical Properties of M_2O_5 (M=V, Nb, Ta) Films.
 Supervisor : Prof. A.G. Vedeshwar
Th 21145

Contents

1. Introduction 2. Growth and characterization techniques 3. Quantum confinement and residual stress effects on optical properties of V_2O_5 films 4. Quantum confinement and residual stress effects on optical properties of Nb_2O_5 films 5. Quantum confinement and residual stress effects on optical properties of Ta_2O_5 films 6. Summary and conclusions.

511. DHINGRA (Mansi)
ZnO/Conducting Polymer interfaces and nanocomposites : Optical, Electrical and Sensing Properties.
 Supervisors : Prof. S. Annapoorni and Dr. P. Senthil Kumar
Th 21177

Contents

1. Introduction 2. Experimental techniques 3. Work like zinc

oxide nanostructures as efficient LPG sensors 4. Impact of interfacial interactions on optical and sensing behavior in zinc oxide/polyaniline structures 5. Polyaniline mediated enhancement in bandgap emission and sensing properties of zinc oxide 6. Current-voltage characteristics of polyaniline nanofibres interfaced with ZnO 7. ZnO/PPy hybrid heterojunction as an ultraviolet photosensor 8. Summary and future Scope. Appendix.

512. GEETA RANI
Structural, Optical and Electrical Studies of Wide Band Gap Nanomaterials.
 Supervisor : Prof. Vinay Gupta
Th 21148

Contents

1. General introduction 2. Experimental techniques 3. Synthesis and characterization of ZNO-ZNS core-Shell and ZNO QD'S Nanostructures.

513. GUPTA (Surbhi)
Growth and Characterization of Pure and Doped Perovskite Bismuth Ferrite Thin Films.
 Supervisor : Prof. Vinay Gupta
Th 21163

Contents

1. Introduction: Multiferroics 2. Bismuth ferrite thin films: Growth and characterization 3. A-site and b-site doping in bfo thin films: Growth and optical characterization 4. Effect of A-site and B- site doping in BFO thin film on the electrical, ferroelectric and magnetic properties 5. (Ce, Mn) codoped BFO and BFMO/BCFO multilayer thin film structure 6. Ferroelectric photovoltaic studies : BCFMO thin film and multilayer BFMO/BCFO structure. Scope of future work, appendices and references.

514. ISHPAL
Study of Conduction Mechanism in Nanostructures of Polypyrrole for Gas Sensing Applications.
 Supervisor : Dr. Amarjeet Kaur
Th 21141

Contents

1. Introduction and literature review 2. Sample preparation and

characterization 3. Structural, morphological and electrical properties of nanostructures of polypyrrole 4. Study of dc conduction mechanism in polypyrrole nanoparticles 5. Study of ac conduction mechanism in polypyrrole nanoparticles 6. Investigations of gas sensing properties of polypyrrole nanostructures through electrical and vibrational spectroscopic techniques 7. Summary and outlook 8. A: Effect of metal oxide doping on the properties of polypyrrole nanoribbons. References.

515. KEDIA (Abhitosh)
Poly (Vinyl Pyrrolidone) Induced Gold Nanostructures : Plasmonic Aspects & Applications.
 Supervisor : Dr. P. Senthil Kumar
Th 21143

Contents

1. Introduction 2. Materials and methods 3. Poly(vinyl pyrrolidone) induced anisotropic gold nanostructures 4. One step synthesis of gold nanostars: Combined optical and cathodoluminescence study 5. Structural-correlated plasmon tuning mechanism of gold nanostars 6. Self-organization/reshaping of gold nanostars 7. Shape selective surface enhanced raman measurements 8. Summary and scope for future study 9. References and appendix.

516. MANPREET KAUR
Study on the Tropospheric Gravity Waves Over the Indonesian Archipelago.
 Supervisor : Prof. S. K. Dhaka
Th 21142

Contents

1. Introduction to the atmosphere 2. Experimental framework 3. Tropospheric gravity waves: Association of vertical wavelength with convection cells 4. Altitude variation of energy content of gravity waves in the troposphere 5. Summary and conclusion. References and bibliography.

517. MAHAJAN (Sonam)
Cavity Quantum Electrodynamics of Bose-Einstein Condensates.
 Supervisors : Prof. Man Mohan and Dr. Aranya B. Bhattacharjee
Th 21151

Contents

1. Introduction 2. Optomechanical cooling and detection of a weak force using a bose-einstein condensate by stochastic cooling feedback technique 3. Comparing back-action and cold damping feedback schemes to cool an optomechanical system consisting of bose-einstein condensates 4. Dynamical effect of periodic modulation of cavity frequency in an optomechanical cavity.

518. MISHRA (Rakesh Kumar)
Growth and Characterization of Semiconductor Quantum Dots in Glass Matrix.
 Supervisor : Prof. A.G. Vegeshwar
Th 21138

Contents

1. Introduction 2. Theoretical background and 3. Growth and characterization of CdS 4. Growth and characterization of CdSe 5. Growth and characterization of $Sb_2 S_3$. 6. Summary and conclusion.

519. MOHD. SULEMAN
Experimental Studies on Gel Polymer Electrolytes Based Solid-state Supercapacitors.
 Supervisor : Dr. S.A. Hashmi
Th 21140

Contents

1. Introduction 2. Experimental techniques 3. Plastic crystal succinonitrile incorporated gel polymer electrolytes 4. Flexible and solid-state electrical double-layer capacitors fabricated with coconut shell derived activated carbon electrodes and plastic crystal based gel polymer electrolytes 5. Flexible, solid-state electrical double-layer capacitors fabricated with Go/R-GO Electrodes and plastic crystal based gel polymer electrolytes 6. Summary and conclusions.

520. MUKESH KUMAR
Signatures of New Physics in the Top Quark Sector.
 Supervisors : Dr. Ashok K. Goyal and Dr. Sukanta Dutta
Th 21157

Contents

1. Introduction 2. Top quark physics in the vector color-octet model 3. Measuring anomalous Wtb couplings at e^+p collider 4. Vector-like Quarks at e^+p collider. References and appendices.

521. NAOREM BILASINI DEVI

Fabrication of Nanostructures using Modified Dense Plasma Focus and their Characterization including Surface Plasmon Resonance.

Supervisors : Prof. M. P. Srivastava and Dr. Savita Roy

Th 21155

Contents

1. Introduction 2. Modified dense plasma focus for nanofabrication and characterization techniques 3. Fabrication of nanoparticles of noble metals viz. Gold and silver and their surface plasmon resonance studies 4. Surface plasmon resonance of fabricated bimetallic nanostructures of silver and gold 5. Fabrication of metal nanoparticles of copper aluminium and titanium and studies of surface plasmon properties 6. Fabrication of germanium nanoparticles and their characterization. References.

522. PAHWA (Isha)

Some Aspects of Cosmology in Higher Dimensions.

Supervisors : Prof. T.R. Seshadri and Prof. Debajyoti Choudhury

Th 21160

Contents

1. Introduction 2. Extra spatial dimensions 3. Late-time acceleration in higher dimensional cosmology 4. Inflation in gauss bonnet cosmology 5. Shear dynamics in higher dimensional cosmology 6. Summary and future prospects.

523. R. SRIKANTH

Mathematical Modeling of Intracellular Signaling Networks of the Immune System.

Supervisors : Prof. Sanjay Jain and Kanury V.S. Rao

Th 21161

Contents

1. Introduction 2. Mathematical Model of the early B cell receptor

signaling 3. Novel System Properties explained by the presence of bistability in the model 4. Factors contributing to robust bistability in early BCR signaling 5. Attempts at developing a boolean model for the early B cell signaling 6. Summary, significance of the study and future perspective.

524. RAZA SHAHID
Structure and Charge Transport Mechanism in Nano-Structured Olivine Phosphate Materials for Energy Storage Applications.
 Supervisor : Dr. S. Murugavel
Th 21152

Contents

1. Introduction 2. Experimental techniques 3. Synthesis and characterization of LiFePO_4 with different particle sizes 4. Unravelling the interplay between particle size, defects concentration and Li-ION transport in LiFePO_4 5. Structure and electronic transport in Li_xFePO_4 6. Particle size dependent charge transport mechanism in $\text{Li}_{0.5}\text{FePO}_4$. 7. Summary and future scope of work. Appendices.

525. SAXENA (Garima)
Study of Time-Delayed Interactions in Coupled Oscillators.
 Supervisor : Dr. Awadhesh Prasad
Th 21149

Contents

1. Introduction 2. Effect of finite response-time in unidirectionally coupled dynamical systems 3. Dynamical effects of integrative time-delay coupling 4. Amplitude death phenomenon in delay-coupled hamiltonian systems 5. Summary and future plans. Appendix and bibliography.

526. SAXENA (Pooja)
Characteristics of Silicon Detectors and Study of Large pt Particle Production at Collider Energies.
 Supervisor : Dr. Kirti Ranjan and Dr. Satyaki Bhattacharya
Th 21178

Contents

1. Introduction 2. CMS experiment at the LHC. 3. Physics Object reconstruction and identification 4. $Z\gamma$ at the CMS experiment 5. Si Sensors development 6. Summary. Bibliography.

527. SINGH (Abhishek Kumar)
Geometric Aspects of D-branes in String Theory
 Supervisor : Prof. Supriya K. Kar
Th 21154

Contents

1. Introduction 2. Gauge theoretic motivation to quantum gravity
 3. Geometric formulatiOn on D_4 - brane 4. Sitter tunnelling
 vacua on D_4 - brane 5. Thermal aspects of de sitter on D_3 - brane
 6. AdS brane black holes 7. Concluding remarks.

528. SIWAL (Davinder)
**Development of Empirical Mode Decomposition Based Signal
 Improvement Method and its Implementation on Pulse Shape
 analysis for a segmented HPGE Detector.**
 Supervisors : Dr. Samit Kr. Mandal and Prof. Raghuvir Singh
Th 21147

Contents

1. Introduction 2. Basic properties of a gamma-ray HPGe detector
 3. Theory of signal decomposition and development of noise
 reduction algorithm 4. Experimental details and pulse shape
 analysis with EMD based algorithm 5. Geant4 simulation studies
 and imaging performance 6. Summary and future outlook.

529. SRIVASTAVA (Manoj Kumar)
**Effect of Substrate induced Strain on Magnetism and
 Magnetotransport in Low Bandwidth Manganite Films.**
 Supervisors : Dr. Amarjeet Kaur and Dr. H.K. Singh
Th 21153

Contents

1. Introduction to the Doped Rare Earth Manganites 2. Experimental
 techniques: Synthesis and characterizations 3. Magnetism and
 magneatotransport in $\text{Sm}_{0.55}\text{Sr}_{0.45}\text{MnO}_3$ thin films: Role of growth
 conditions and strain 4. Impact of strain on magnetic phase
 coexistence and first order phase transition in $\text{Sm}_{0.53}\text{Sr}_{0.47}$
 MnO_3 thin films 5. Impact of strain on magnetism and
 magnetotransport in $\text{Sm}_{0.45}\text{Nd}_{0.08}\text{Sr}_{0.47}\text{MnO}_3$ thin film 6. Impact
 of strain on magnetism metamagnetism and magnetotransport
 in $\text{Sm}_{0.50}\text{Sr}_{0.50}\text{MnO}_3$ Thin films 7. Magnetism and
 magneatotransport anisotropy in $\text{Nd}_{0.55}\times\text{Sm}\times\text{Sr}_{0.45}\text{MnO}_3$ (x=0.00-0.45)
 Thin films. Annexutre and references.

530. SUNITA
D-brane World and String Theory.
 Supervisor : Dr. Supriya K. Kar
Th 21159

Contents

1. introduction 2. Quantum gravity : A gauge theoretic approach.
 3. Emergent kerr black hole in 5D 4. Quantum kerr (newman)
 degenerate vacua in 4D 5. Quantum tunneling branes 6.
 Conclusions.

531. SURBHI KUMARI
**Luminescence Studies of Some Organic Dyes in Solutions
 and Porous Materials and their Interaction with Toxic Gases.**
 Supervisor : Prof. P.D. Sahare
Th 21156

Contents

1. Introduction 2. Experimental 3. Photoluminescence study of
 organic dye solution with toxic gases 4. Photoluminescence
 studies of organic dyes incorporated in Mesoporous silica
 nanoparticles 5. Photoluminescence studies on dye incorporated
 mesoporous silica nanoparticles (MSN_s) and other porous
 materials 6. Summary and Scope for further study.

532. THAKUR (Shruti)
Cosmological Models for Accelerated Expansion.
 Supervisor : Prof. T. R. Seshadri
Th 21139

Contents

1. Introduction 2. $f(R)$ gravity models 3. Minimally coupled and
 non-minimally coupled $f(R)$ models 4. Perturbations in
 non-minimally coupled $f(R)$ models 5. Two different behaviours
 of scalar field models and their observational evidence 6.
 Conclusions and future prospects.

533. TRIVEDI (Pranjal)
Probes of Primordial Fields in the Universe.
 Supervisors : Prof. T. R. Seshadri and
 Prof. Kandaswamy Subramanian
Th 21162

Contents

1. Introduction 2. CMB bispectrum from primordial magnetic fields 3. CMB trispectrum sourced by magnetic energy density 4. CMB trispectrum sourced by magnetic scalar anisotropic stress 5. Flat-sky analysis of magnetic CMB bispectra and trispectra 6. Probing primordial fields via distortions of cosmic rulers 7. Conclusions and future prospects.

534. TYAGI (Manisha)

Studies on Nickel Oxide Thin Films, Heterojunctions and Homojunctions for functional Devices.

Supervisor : Prof. Vinay Gupta

Th 21150

Contents

1. Introduction to multifunctional materials and devices for biosensing and optoelectronic applications 2. Growth and characterization of P-type NiO thin film. 3 NiO thin films based urea biosensor 4. Growth of NiO nanostructures and their application in urea biosensing. P-type NiO thin film based UV photodiodes 6. NiO nanostructures based heterojunctions UV photodiodes 7. NiO thin film based p-n homojunction 6. Scope and suggestions for future work, appendix and references.