CHAPTER 45

PHYSICS AND ASTROPHYSICS

Doctoral Theses

491. AGGARWAL (Sunny)
Study of Atomic Structure and Ionization Processes in Highly Charged Ions.
Supervisor : Prof. Man Mohan
Th 20278

Contents

1. Introduction . 2. Atomic structure calculations using configuration interaction method. 3. Multiconfigurational dirac-fock energy levels and radiative rates for W XL and Kr XXXV.4. Photoionization calculations using R-matrix method.

492. AHUJA (Sudha)
Measurement of Direct Photon Production with the CMS Detector at LHC.
Supervisor : Prof. Brajesh Chandra Choudhary
Th 20232

Contents

1. The theoretical perspective. 2. The experimental apparatus. 3. Event simulation & data collection. 4. Reconstruction of physics objects. 5. Inclusive photon measurement using 2010 data. 6. Photon + jet measurement using 2011 data. 7. Summary, Conclusions and Bibliography.

493. ANUJ KUMAR
Co-existence of Superconductivity and Magnetism in Rutheno-cuprates, Non-oxide Perovskite $MgCNi_3$ and FeSe/Te Systems.
Supervisors : Prof. R. P. Tandon and Dr. V. P. S. Awana
Th 19941

Contents

1. Introduction and literature review on rutheno-cuprates, $MgCNi_3$ and FeSe/Te Systems. 2. Experimental techniques: s ynthesis and characterization. 3. Physical properties of pure and doped EuRu-1222 magneto-superconductor. 4. Spin-glass behavior and cluster ferromagnetism in EuRu-1222 megneto-superconductor. 5. Spin dynamics, short-range order and superparamagnetism in GdRu-1222 Magneto-supercondoctor. 6. Spin-glass, cluster ferromagnetism, superparamagnetism in YRu-1222 and magnetic, thermal properties of YRU-1212. 7. Superconductivity and magnetism in non-oxide perovskite $MgCNi_3$. 8. Superconductivity and magnetism in Fe-based chalcogenides superconductor. Summary and Future Scope of Work and Conclusion.

494. ARYA (Urvashi)
Effect of Intense Laser Fields on Atomic Excitation and Rotational Dynamics of Polar Molecules.
Supervisor : Dr. Vinod Prasad
Th 19958

Contents

1. Introduction. 2. Collisional process in Microwave field. 3. Nonadiabatic Rotational dynamics and orientation of polar molecule. 4. Alignment of molecule. 5. Orientation dynamics due to shaped pulses. Conclusion and References.

495. BHASKER RAJ (B.)
Fabrication of Metal Oxide Thin Films based Surface Acoustic Wave (SAW) Sensors for the Detection of Toxic Vapors/ Gases.
Supervisor : Prof. Vinay Gupta
Th 19938

Contents

1. Surface acoustic wave sensors: an introduction. 2. Device fabrication and characterization techniques. 3. ZnO thin film SAW sensor for the detection of ammonia. 4. Sensing mechanism of the distinct response obtained for liquor ammonia. 5. SAW sensor for detection of oxidizing gas (NO_2) using SnO_2 sensing layer. 6. SAW electronic-nose for chemical warfare agents (CAW). 7. Scope and suggestions for future work. References

496. DABAS (Seema)
Thermal, Scattering and Transport Processes in Single-walled Carbon Nanotube Ropes and Multi-walled Carbon Nanotubes.
Supervisors : Dr. Poonam Silotia and Prof. S. P. Tewari
Th 19943

Contents

1. Introduction. 2. Specific heat of pure single-walled carbon nanotube ropes and with adsorbed helium-4 atoms. 3. Specific heat of aligned multi-walled carbon nanotubes. 4. Specific heat of un-aligned multi-walled carbon nanotubes. 5. Thermal conductivity of single-walled carbon nanotube ropes. 6. Thermal neutron scattering and transport in un-aligned multi-walled carbon nanotubes. 7. References and Conclusion.

497. DASGUPTA (Daipayan)
Development of Thin Film based Surface Acoustic Wave (SAW) Sensor.
Supervisor : Prof. K. Sreenivas
Th 19956

Contents

1. Surface acoustic wave and UV photo-detector. 2. Statement of the problem and thesis objectives. 3. Experimental techniques. 4. ZnO metal semicondoctor metal photodetector. 5. Development of Acoustic wave (SAW) sensors. 6. Mag-netoelectric (ME) effects with ZnO films on nickel and metglas. 7. Scope for future work and References.

498. DIWAN (Puja)
Polymer Electrolyte Composites for Device Applications.
Supervisor : Dr. Amita Chandra
Th 19955

Contents

1. Introduction. 2. Synthesis and characterization techniques. 3. Polymer electrolyte composites with dispersed graphene. 4. Polymer electrolyte composite with dispersed silica. 5. Polymer elcetrolyte composites with dispersed transition metal oxides' nanoparticles. 6. Summary and future work and List of publications.

499. GOSAIN (Dharmender Singh)
Formation of Quark-gluon Plasma and Quark-hadron Phase Transition.
Supervisor : Dr. S. Somorendro Singh
Th 19952

Contents

1. Introduction. 2. Statistical models of atoms and nucleons as templates. 3. Effect of curvature on a statistical model of quark-gluon plasma fireball in the hadronic medium. 4. Nucleation rate of the quark-gluon plasma droplet at finite quark chemical potential. 5. Equation of state of quark-gluon plasma using a simple statistical model. 6. Summary, Conclusion and Bibliography.

500. KASHYAP (Raman)
Synthesis and Characterization of Modified Calcium Copper Titanate (CCTO) Ceramics and its Composites.
Supervisors : Prof. R. P. Tandon and Dr. O. P. Thakur
Th 19959

Contents

1. Introduction. 2. Experimental techniques. 3. Synthesis and effect of sintering conditions on structural and electrical propertiesof $CaCu_3Ti_4O_{12}$. 4. Substitutional effect of Dy on structural, dielectric and electrical properties of $CaCu_3Ti_4O_{12}$. 5. Substitutional effect of Gd on structural, dielectric and electrical properities of $CaCu_3Ti_4O_{12}$. 6. Structural, dielectric and electrical properities of $CaCu_3Ti_4O_{12}$. 7. Conclusion and future scope of work. and list of publications.

501. LAHON (Siddhartha)
Laser Induced Nonlinear Processes in Quantum Dots.
Supervisors : Prof. Man Mohan and Dr. P. K. Jha
Th 19961

Contents

1. Laser induced nonlinear processes in quantum dots. 2. Laser interaction with quantum dots and related single photon and multiphoton transitions. 3. Laser induced nonlinear effects in quantum dots using density matrux approach. 4. High harmonic generation from quantum dots. 5. Concluding remarks and Reprints of the published papers.

502. MALIK (Anu)
Effect of Nanomaterials on the Dielectric and Electro-optical Properities of Ferroelectric Liquid Crystals.
Supervisors : Dr. Poonam Silotia and Dr. Ashok. M. Biradar
Th 19944

Contents

1. Introduction to liquid crystals. 2. Experimental techniques. 3. Role of polymer coating on the memory effect of ferroelectric liquid crystals. 4. Graphene oxide induced homeotropic alignment in ferroelectric liquid crystals. 5. Effect of copper oxide decorated carbon nanotubes on the response time of ferroelectric liquid crystals. 6. Effect of zinc oxide nanoparticles on the transition temperature and dielectric properties of electroclinic liquid crystals. 7. Conclusions and futurre scope of work.

503. MANISHA
Optical Properties of Undoped and Erbium Doped Ag/ Au-dielectric Nanocomposites and the Effect of Swift Heavy Ions.
Supervisors : Prof. S. Annapoorni and Dr. D. K. Avasthi
Th 19951

Contents

1. Introduction. 2. Experimental techniques. 3. Plasmonic behavior of Au-Al_2O_3 thin films deposited by ABS and BSA detection using SPR. 4. Annealing induced reverse tuning of SPR of Au-Al_2O_3 nanocomposites. 5. SHI induced changes in the SPR of Au-Al_2O_3 nanocomposites. 6. SHI induced plasmonic behavior in Au-ZnO thin films deposited by ABS. 7. Photoluminescence enhancement of Er^{+3}-SiO_2 in the presence of Ag and the effect of thermal annealing. 8. Summary and future scope and Reference.

504. MANISHA
Structure, Electrical and Defect Studies of Tellurium Based Chalcogenide Glasses for Phase Change Memory Applications.
Supervisor : Dr. S. Murugavel
Th 20277

Contents

1. Chalcogenide alloys - A possible candidate for phase change memory applications. 2. Experimental anc characterization

techniques. 3. Structural study on amorphous and crystalline state of phase change material. 4. Thermal, electrical, structural and defect studies on binary Ge-Te glassy and crystalline system. 5. Electrical conduction mechanism in memory and threshold switching glasses : A study on Al-As-Te system. 6. Structural studies on Ge-Sb-Te based phase change memory materials. 7. Summary and future scope of work.

505. MEDWAL (Rohit)
Structural and Mag-netic Phase Transition of Hard Magnetic FePt Alloy Nanostructures.
Supervisor : Prof. S. Annapoorni
Th 19947

Contents

1. Introduction. 2. Characterization technique. 3. Order-disorder investigation of hard magnetic FePt Nanostructured alloy. 4. Temperature dependent magnetic and structural ordering of self assembled magnetic array of fept nanoparticles. 5. Long range positional ordering of FePt nanoparticles using langmuir blodgett film deposition method. 6. Effect of off-stoichiometric and additives on the ordering temperature of FePt nanoparticles. 7. Plasma assisted synthesis and modification of FePt nanostructures. 8. Summary, Conclusion and future scope.

506. MEENA (Pappu Lal)
Multicomponent Oxides for Ferroic Applications.
Supervisor : Prof. K. Sreenivas
Th 19957

Contents

1. Introduction to multiferroics. 2. Statement of the problem and thesis objectives. 3. Experimental and characterization techniques. 4. Rietveld refinement, cation distribution and spectroscopic analysis of $Co3_{-x}Mn_xO_4$. 5. Dielectric and conductivity studies of $Co3_{-x}Mn_xO_4$. 6. Magnetic study of $Co3_{-x}Mn_xO_4$. 7. Scope and suggestions for future work.

507. NAYYAR (Ruchika)
Search for the Standard Model Higgs Boson in Di-Electron Plus Missing Transverse Energy Final States at$\sqrt{s}$ = 1.96 TeV with DØ Experiment.
Supervisor : Dr. Kirti Ranjan
Th 19940

Contents

1. Introduction. 2. The DØ experiment and the tevatron. 3. Object identification. 4. The $H \rightarrow WW^* \rightarrow e^{\pm}V_e e^{\pm}Ve$ Channel. 5. The $H \rightarrow WW^* \rightarrow \mu^{\pm}V_{\mu}T^{\pm}hadV_T$ final state. 6. Summary and appendices. Bibliography.

508. PARVEEN
Studies on Carbon Nanotubes Reinforced Polymer Based Composites.
Supervisor : Prof. R. P. Tandon and Dr. R. B. Mathur
Th 19954

Contents

1. Introduction: composites & a selective history of CNT reinforced composites. 2. Synthesis, characterization and measurements. 3. Mechanical properties of CNT-epoxy composites. 4. Electrical properties & EMI shielding of CNT-Epoxy composites. 5. CNT-phenol composites with high filler contents-bucky paper route. 6. Mechanical & electrical properties of CNT-thermoplastic composites. 7. Conlusions and future projections. References.

509. POONAM
Study of Electronic Transport in Fuctionalized Carbon Nanotube and Graphene Sensors.
Supervisor : Dr. Nivedita Deo
Th 19963

Contents

1. Introduction and motivation. 2. Basics of graphene and carbon nanotubes. 3. DNA decorated CNT sensors: experiment and simple model. 4. Nonequilibrium green's function (NEGF) formalism. 5. DNA functionalized CNT sensors: electronic transport. 6. CNT decorated with au clusters as CO gas sensor. 7. DNA-decorated graphene sensors. 8. Correlation function. 9. Conclusions, discussion and future outlook. Bibliography.

510. SAHARAN (Ritu)
Study of Copolymers of Substituted Polynilines and M-Aminobenzene Sulfonic Acid : synthesis, Characterization and Device Applications.
Supervisor : Dr. Amarjeet Kaur
Th 20279

Contents

1. Introduction to conducting polymers. 2. Preparation of the samples charecterization and experimental techniques. 3. Charecterization of self-doped and ptsadoped copolymers of 3-ABSA with substituted aniline. 4. DC conductivity and antistatic properties of self-doped and PTSA-doped copolymers. 5. AC conductivity and dielectric relaxation in self-doped copolymer poly(3-ABSA-CO-OMAA). 6. Electrochemical growth, CYCLIC voltametry, chronoamperometry studies and applications for electrochromic devices. 7. Summary of the important results of the thesis and future plan.

511. SEHDEV (Neeru)
Cobalt Based Hard Magnetic Nanostructures: $L1_0$ CoPt Alloys and $CoFe_2O_4$.
Supervisor : Prof. S. Annapoorni
Th 19946

Contents

1. Introduction. 2. Experimental techniques. 3. Structural and magnetic phase transition of CoPt alloy nanoparticles. 4. Ag assisted evolution of ordered $L1_0$ CoPt Alloy Nanoparticles. 5. Synthesis and controlled alignment of CoPt nanoparticles using anodic atmospheric microplasma discharge. 6. Correlation of interlayer diffusion with the stoichiometric composition of RF sputtered Pt/Co/Pt sandwiched structures. 7. Switching field distribution: tunability of crystallographic and magnetic orientation in DC sputtered Pt/Co/Pt multilayers. 8. Dense electronic excitations induced defect mediated diffusion in Pt/ Co/Pt multilayers. 9. Hydrogen plasma processing and exchange spring studies on cobalt ferrite based nanostructures. 10. Summary and Conclusions.

512. SELLAM
Studies on Ion Conducting Polymers for their Application as Electrolytes in Supercapacitors.
Supervisor : Dr. S. A. Hashmi
Th 19953

Contents

1. Introduction. 2. Experimental techniques. 3. Proton conducting polymer-based electrolytes: structural, thermal and electro-chemical properties. 4. Studies on redox supercapacitors using

poly (3-methyl thiophene)/RuO_2.xH_2Ocomposite electrodes and proton conducting polymer electrolytes. 5. Investigations on pedot-pss based high-rate supercapacitors using proton-conducting gel polymer electrolytes. 6. Pedot-pss/RuO_2.xH_2O composite electrodes for redox supercapacitors using proton conducting Gel/polymer electrolytes. 7. Summary and Conclusions.

513. SHARMA (Anjali)
Development of Tin Oxide (SnO_2) Thin Film Based Low Temperature Operated NO_2 Gas Sensors.
Supervisor : Prof. Vinay Gupta
Th 19960

Contents

1. Introduction and aim of the present work. 2. SnO_2 thin film based NO_2 gas sensor. 3. Modifier incorporated SnO2 thin film based heterostructure sensors for NO_2 gas. 4. n-n heterojunction sensors (Al_2O_3/SnO_2 and WO_3/SnO_2) for efficint detection of NO_2 gas. 5. SnO_2 decorated MWCNTs based hybrid nanocomposite gas sensor. 6. Packaged NO_2 gas sensors. 7. Appendix, Scope and Suggestions for Future Work. References.

514. SUNIL KUMAR
Statistical Mechanics of Complex Systems: Correlation, Networks and Multifractality in Financial Time Series.
Supervisor : Dr. Nivedita Deo
Th 19962

Contents

1. Introduction. 2. Random matrix approach to financial markets. 3. Network analysis of financial indices. 4. Multifractal analysis of global financial indices. 5. Summary, Conclusion and Bibliography.

515. SUYAL (Vinita)
Time Series Analyses of Astrophysical Time Series Data.
Supervisors : Prof. Harinder P. Singh and Dr. Awadhesh Prasad
Th 19945

Contents

1. Introduction. 2. Nonlinear time series analysis of sunspot data. 3. Hysteresis in a solar activity cycle. 4. Symbolic analysis of slow solar wind data using rank order statistics. 5. Visibility graph analysis of solar wind velocity. 6. Conclusions and Bibliography.

516. SWAMI NANDAN
Study of Pseudosymmetries and Generation of first Integrals in Analytical Mechanics.
Supervisor : Dr. S. K. Soni
Th 19950

Contents

1. Introduction. 2. Dynamical symmetries and 'canonical' nambu-poisson bracket. 3. Canonical form of nambu-poisson bracket. 4. Nambu mechanics, integrating factors and multi-hamiltonian structure. 5. Pseudosymmetries and integrals of motion. 6. Discussion, Conclusions and Bibliography.

517. VAID (Chitra)
Investigations on Bioactive Glass and Glass-Ceramics for Biomedical Applications.
Supervisor : Dr. S. Murugavel
Th 19939

Contents

1. Introduction. 2. Experimental techniques. 3. Ion transport mechanism in glasses: non-arrhenius conductivity and non-universal features. 4. Sodium ion transport in alkali-alkaline earth silicate glasses: an influence of local atomic structure. 5. Synthesis and in-vitro bioactivity: mesoporous sodium silicate glasses. 6. Sodium containing multicomponent mesoporous bioactive glasses: synthesis, characterization and in-vitro bioactivity. 7. Mesoporous bioactive glass and glass-ceramics: influence of the local structure on the behaviour of in vitro bioactivity. 8. Summary and future scope of work.

518. VERMA (Manish Kumar)
Growth and Characterization of Nanocomposite Thin Films for Sensor Applications.
Supervisor : Prof. Vinay Gupta
Th 19942

Contents

1. Introduction and aim of the present work. 2. Growth and characterization of SnO_2 thin film. 3. SnO_2 thin film based H_2 gas sensor. 4. Zno-SnO_2 composite sensor for H_2 Gas sensing. 5. SnO_2 thin film based H_2S gas sensor. 6. Scope and suggestions for future work. References.

519. VERMA (Priyanka)
Study of Bose-Einstein Condensates in Superfluid Regime.
Supervisor : Prof. Man Mohan
Th 19949

Contents

1. Introduction. 2. Superfluid properties of bec in an optical lattice inside an optomechanical cavity. 3. Optomehcanical effects in self-organization of a bose-einstein condensate in an optical cavity. 4. Parametric excitations in bose-einstein condensate in an optical lattice trap. 5. Concluding remarks.

520. YOGESH KUMAR
Heavy-Ion-Collision and Quark-Gluon Plasma.
Supervisor : Dr. S. Somorendro Singh
Th 19948

Contents

1. Introduction. 2. Free energy evolution of QGP and quark-hadron phase transition. 3. Dilepton production in finite baryonic quark-gluon plasma. 4. Dilepton emission at temperature dependent baryonic quark-gluon plasma. 5. Photon rediation from quark-gluon plasma. 6. Summary Concluding remarks and Bibliography.