CHAPTER 54

TECHNOLOGY
APPLIED SCIENCES AND HUMANITIES

Doctoral Theses

01.   CHUTANI (Lakshika)
On Some Growth Properties and Functional Analytic Structure of Entire Dirichlet Series in Several Complex Variables.
Supervisor: Dr. Niraj Kumar
Th 24786

Contents

1. Introduction 2. Certain result on a class of entire dirichlet series in two variables 3. On entire functions represented by the double dirichlet series 4. On entire dirichlet series in two variables 5. Growth and bornological proper rites of vector valued entire dirichlet series 6. On a class of a vector valued entire series in n-variables 7. FK space and frechet space for a class of vector valued dirichlet series in n-variables 8. Bibliography.

02.   MALIK (Parul)
Structure Property Relationship Studies on Grapheme Reinforced Nanocomposites.
Supervisor: Dr. Purnima Jain
Th 24787

Abstract
(Not Verified)

This thesis presents study of graphene reinforced polymer nanocomposites and effect of graphene on mechanical, rheological, morphological and thermal properties of nanocomposites. Recently, Graphene oxide has attracted much attention in commercial as well as research areas because of its remarkable properties. Graphene oxide has many promising properties itself, such as high level of dispersion in polar solvents and good compatibility with various polymers. Additions of nano-fillers in nanocomposites have been studied for several years. In recent year's clay and carbon nanotubes have been in focus as reinforcement. Graphene oxide is considered very promising for reinforcement of nanocomposites and several studies have shown improvements in Young's Modulus, tensile strength, Tg, thermal stability and dispersity by adding graphene oxide into nanocomposites.In this work, the way in which the mechanical, rheological, morphological and thermal properties of epoxy composite materials were affected by addition of various forms of graphene was studied. Epoxy resin (Araldite LY556) was used in all experiments, while other parameters were changed. Various experiments were performed with addition of graphene, graphene oxide and functionalized graphene oxide at different composition. Acetone was used as

solvent, APTS (3-Aminopropyl triethoxy silane) was used for the functionalization of the graphene oxide and TETA has been used as hardener. Graphene, graphene oxide and functionalized graphene oxide were dispersed in an ultrasonic bath. The graphene oxide dispersions were analyzed in a disk centrifuge. This data was used for the further experiments when transferring graphene oxide into the epoxy. The graphene oxide was wet transferred into the epoxy in acetone. The functionalized graphene oxide was analyzed with FTIR, XRD.

Contents

1. Introduction and literature survey 2. Material and experimental techniques 3. Synthesis and characterization of graphene oxide and functionalized graphene oxide 4. Studies on mechanical properties of graphene reinforced epoxy nanocmposites 5. Studies on morphological properties of graphene reinforced epoxy nanocomposites 6. Studies on thermal properties of graphene reinforced epoxy nanocomposites 7.Studies on rhelological properties of graphene reinforced epoxy nanocomposites 8. Summary and future scope 9. List of publications.

03.   MEHLA (Sonu)
Evolution Of Discontinuous Waves and Their Interaction for Hyperbolic Quasilinear Systems .
Supervisor: Prof. J. Jena
Th 24788

Abstract
(Not Verified)

This thesis consists of five chapters and the first chapter is the introductory, consisting of the overview of the works presented in this thesis. The second chapter is concerned about the theory of singular surface and its use to study the behaviour of different ways of wave propagation and its climactic point into discontinuities in a flow of real gas at the wave fronts. The medium considered is inviscid, unsteady, one dimensional gas, and the flow is cylindrically symmetric. An axial magnetic field is assumed to exist intially in the conducting gas. We obtained the transport equation for the jump in velocity gradient, which is a Bernoulli type equation. The third chapter is related about the evolutionary behaviour of one dimensional discontinuous waves propagating through a medium of relaxing gas with dust particle. It is assumed that the translational and rotational modes are in local therodynamical equilibrium. Here, we obtained the transport equations of infinite hierarcy by employing the process of kinematics of a one dimensional flow. For the description of the evolutionary nature of shock of arbitrary strength, we derived the first three truncation approximations. The fourth chapter is concerned about the similarity solution of spherical shock waves in the presence of gravititional field of a variable point mass. We have a system of hydrodynamic equations describing the adiabatic, spherical flow of non-ideal gas. Similarity solution is discussed with the help of Lie group of transformations. Here, we study the imploding shock in detail. The fifth chapter is concerned about the far-field behaviour of waves under the influence of strong transverse magnetic field. To describe the far-field behaviour of waves, we used asymptotic expansions procedure and derived the

evolution equation, which is an inviscid generalized Burger's equation and is solved numerically using Fourier Galerkin Spectral method.

Contents

1. Introduction 2. Steepening of waves in a non ideal gas with axial magnetic field 3. Shock wave kinematics in relaxing gas with dust particles 4. Similarity solution of spherical shock waves in the gravitational field of variable point mass 5. Far-field behaviour of shock waves magnetogasdynamics 6. Bibliography.

04.   NAGPAL (Ritika)
Isotropic and Anisotropic Cosmologies in Alternative Theory of Gravity.
Supervisor: Dr. Jainendra Kumar Singh
Th 24785

Abstract
(Not Verified)

Comprises seven chapters. Chapter 1 is of introductory nature in which we have discussed about the General Theory of Relativity and modified theories of gravity. In this thesis, we have studied some cosmic scenarios in modified f(R,T) theory. We have described cosmological models using parametric reconstruction method to study the cosmic history and current accelerating universe. In chapter 2, using parametric aproach, a flat FLRW model have been considered with modified Chaplygin gas in particle creation mechanism. Chapter 3 deals with a specific form of Hubble parameter to study bouncing scenario. In chapter 4, we have studied a cosmological model filled with matter that does not behave like perfect fluid. In this chapter, we have analysed the properties of quark and strange quark matter. Chapter 5 deals with a more general form of f(R,T) function which starts with a quadratic correction of geometric term f(R) and a linear matter term f(T). We have taken a form of scale factor which is the outcome of a time dependent deceleration parameter. In Chapter 6, the solution of field equations are derived for dynamical vacuum energy in f(R,T) gravity. A simple parametrization of Hubble parameter has been adopted to find the solution of field equations. We have performed geometrical diagnostics tools to distinguish our model with other dark energy models. It is known in cosmology that different observational datasets have been used to examine the consistency of the model. Therefore, this cosmological impressive feature named as observational cosmology is used in chapter 5, 6. The datasets are used with the help of statistical analysis to constraint the model parameters so that the behavior of cosmological parameters can be analyzed graphically. Chapter 7 consists summary and the fututre scope of the thesis.

Contents

1.Introduction 2. Statefinder diagnostic for modified chaplygin gas cosmology in f(R, T) gravity with particle creation 3. Bouncing cosmology in f(R,T) gravity 4. FLRW cosmological modes with quark and strange quark matters in f(R,T) gravity 5. Cosmological aspects of a hyperbolic solution in f(R,T) modified gravity 6. Analysis with observation constraints in ^

cosmology in f(R, T) gravity 7. Summary and future prospects 8. Bibliography 9. List of publications.

05.   PANDEY (Ajit Kumar)
Study of Some Organic Compounds as Potential Corrosion Inhibitors.
Supervisors: Prof. Sanjeev Thakur and Dr. Ashish Kumar Singh
<u>Th 24790</u>

Contents

1. Introduction 2. Experimental 3. Investigation of some aromatic hydrazones of indole derivatives for antic anticorrosion study of mild steel in 1M HCI 4. Investigation of some aromatic hydrazones of thiophene derivatives for anticorrosion study of mild steel in 0.5 M H_2SO_4 5. Summary and conclusion 6. List of publication and conferences.

06.   RAI (Sneha)
Systems and Structural Study of Lipid-Protein Interaction in Hyperlipidemia Induced Diseases.
Supervisor: Prof. Sonika Bhatnagar
<u>Th 24789</u>

Abstract
(Not Verified)

Lipids perform several important functions in the biological system. They are involved in energy storage, form structural component of cellular membranes and act as messengers facilitating communications within as well as between cells. Lipid signaling also differs from protein-protein signaling as lipids can freely diffuse through the membrane. Therefore, lipid mediated structure and signaling plays an important role in health and disease. Hyperlipidemia (HL), refers to an abnormal increase in the level of blood lipids or lipoproteins. It is a major risk factor for Cardiovascular Diseases (CVD), which is leading cause of death worldwide. HL may occur because of familial (primary) or non-familial (secondary/acquired) forms. However, due to sedentary lifestyle, physical inactivity and unhealthy diet, the incidence of acquired HL has increased. This thesis work, therefore, covers both system-wide and structural aspect of lipid-protein interactions. The network studies provided novel insights into the systemic role of various lipid species in HL and its associated diseases. Network studies also identified potential drug targets and polypharmacology of approved HL drug targets that may benefit in future pharmaceutical research. The systematic meta-analysis of lipidomics studies in HL and CVD showed changes in level and composition of specific lipid species that may assist in accurate prediction of individuals at CVD risk. Lastly, the modeling and simulation studies on bound and unbound PHη1 and PHη2, provides novel insights into regulation of PHη1 and PHη2 on phosphoinositide head group binding. However, future experimental studies are required to validate the novel drugs/ drug targets as well as to establish the range of these lipid biomarkers in healthy and diseased states in different populations and conditions.

Contents

1. Introduction and Literature review 2. Material and methods 3. Role of lipid protein interactions in hyperlipidemia: a systems biology approach 4. Analysis of lipidomics data a identify novel lipid biomarkers for HL and CVD 5. Modeling and molecular dynamics simulation of PHἠ1 and PHἠ2 in complex with phosphoinositide head group 6. Conclusion and frame work 7. List of publication 8. Bibliography.

07. SHARMA (Reetu)
Spectroscopic and X-Ray Studies of Metal Oxide Nanostructure for Solar Energy Conversion.
Supervisors: Prof. Anajana Sarkar and Prof. Ranjana Jha
Th 24932

Abstract
(Not Verified)

The thesis entitled "The Spectroscopic and X-ray Studies of Metal Oxide Nanostructure for Solar Energy Conversion", is consisted of eight chapters and is focused on the the synthesis of the nanostructures of pure TiO2, pure α-MoO3, TiO2-MoO3 core shell nanostructures and α-MoO3 doped variants using Silver and Platinum noble metals by following the various routes of synthesis of nanoparticles which were simple and cost effective. Various nanomaterials are successfully synthesized with the help of hydrothermal method, sol-gel method and microemulsion method and the effect of different reaction conditions has also been studied. The growth mechanism of prepared materials were discussed in detail in thesis. The optical properties are governed by structural properties. Excellent optical properties were seen in terms of absorption spectra and emission patterns in case of all samples as mentioned in thesis. The fabricated and designed materials are of exclusive morphologies and interesting nano-dimensions. Besides the synthesis, the fabricated materials are studies for electrochemical activities, photochromic performances and dye-sensitized solar cell's performances. The mechanism involved in electrochemical studies was diffusion controlled in all samples. The lower values of resistance and higher current value made the synthesized products suitable for energy devices. Photochromic properties were seen in prepared samples due to the LSPR, which were up to the near IR region. The maximum solar cell efficiency achieved, was 5.41 %. The outstanding findings may provide the insights to explore these materials in the energy related fields.

Contents

1. Introduction 2. Processes of synthesis and techniques for the characterization of the nonmaterials 3. Growth of φ-MoO3 nanostructues, Structural optical and electrochemical studies 4.Fabrication of φ-MoO3 nanomaterial and its doped variants under controlled reaction conditions for efficient electrochemical and photochromic performances 5. Facile hydrothermal synthesis of TiO_2-MoO_3 core-shell nanostructure for enhanced

electrocatalytic and photochromic performance 6. Sol-Gel medicated synthesis of TiO$_2$ Nano crystals: Structural optical and electrochemical properties 7. Synthesis of phase controlled TiO$_2$ nanosphere via microemulsion route for enhanced electrochemical and photovoltaic application 8. Summary and future scope 9. List of publications and presentations.

08.   SRIVASATAV (Vartika)
Novel Anti Candid Compounds From Actinomycetes Isolated From Various Sources: Isolation, Identification and Characterization.
Supervisor: Prof. Ashok k. Dubey
Th 24791

Abstract
(Verified)

Actinobacteria were isolated from different soil samples. Based on the results of primary screening for anti-Candida activity, an actinobacterial isolate namely strain ADP4 was selected for further purification and characterization of anti-Candida compounds. The optimum temperature and pH for production was 28 ºC and 7.0 respectively whereas NaCl did not affect production of active metabolites. Strain ADP4 was identified on the basis of 16S rRNA gene sequence, based on the analysis it was identified as a strain of S. chrestomyceticus.Anti-Candida metabolites produced in DPB and SDB media was characterized for its activity against different Candida spp. and their activity against C. albicans biofilm was also studied. Subsequently, based on novelity of metabolites as per GC-MS analysis, SDB medium was selected for production of anti-Candida compounds. The metabolite extract possessing anti-Candida activity was fractionated by column chromatography on silica gel and characterized further. The purified fractions obtained by chromatography were analyzed for their anti-Candida activities. The active fractions were further purified using different solvents and TLC based separation techniques. This resulted in purification of eight partially purified metabolite preprations. These partially purified metabolites were characterized for their inhibitory activity against various virulence factors of Candida sp.The purification of active fractions from gradient Hexane-Chloroform (1:9) resulted in a single band on TLC plate. The anti-Candida activity of single band was confirmed. Structure was determined through different spectral techniques. Spectral analysis suggested that the compound is novel acyclic monoterpenic acetate, which was later on named as chrestosyl acetate. Characterization of chrestosyl acetate was done based on MIC90, MFC, BIC90 values and its inhibitory activity against other virulence factors (extracellular enzyme production and yeast to hyphae switching) were also established. Cytotoxic study for chrestosyl acetate was also performed using RAW 264.7 cell lines.

Contents

1. Introduction and objectives 2. Literature review 3. Material and methods 4. Result and discussion 5. Summary. Bibliography and Appendix.