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SECTION OF PHYSICAL SCIENCE

THE INDIAN SCIENCE CONGRESS ASSOCIATION  
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**PROCEEDINGS  
OF THE  
108<sup>th</sup> INDIAN SCIENCE CONGRESS  
NAGPUR, 2023**

**PART II  
SECTION OF  
PHYSICAL SCIENCES**

***President: Prof. Suresh Chandra***

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**108<sup>th</sup> INDIAN SCIENCE CONGRESS 2023**  
**3 – 7 January, 2023**  
**Nagpur**

**I**  
**PRESIDENTIAL ADDRESS**

***President: Prof. Suresh Chandra***



**PRESIDENTIAL ADDRESS**

**IMPORTANCE OF MOLECULES IN THE STUDY OF UNIVERSE**

**SURESH CHANDRA**

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**Abstract**

Molecule is a system of two or more atoms, having a size of few Angstroms. The Universe is a system consists of everything, and its size is huge and is considered about 93 billion light-years. For the study of a distant part of the universe, the radiations produced by the molecules, present there, may play an important role for providing valuable information about the physical conditions prevailing and the chemical reactions going on there.

The molecules also provide valuable information about the physical conditions at the time of the birth of a star and at the time of the death of a star. Besides the emission and absorption features shown by the molecules in our terrestrial laboratories, the molecules in the ISM show the natural MASERS and the phenomenon of anomalous absorption (the absorption against the CMB). For the Search of Extraterrestrial Intelligence (SETI), the molecules provide information, as a number of prebiotic molecules have been found in the ISM. Further, the scientists are searching exo-planets, aiming the search of life on some exo-planets.

Many Young Scientists have interest in Astronomy & Astrophysics (A&A) and have series of questions/doubts about this field. Opportunities and some challenges in the field of A&A are discussed.

When we discuss about the A&A, a common person thinks about the Astrology, as the Astrology is deeply rooted in our life from the Birth up to the Death. So, I have tried to provide a picture of A&A versus Astrology.



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**II**  
**ABSTRACTS OF**  
**PLATINUM JUBILEE LECTURES**





**PLATINUM JUBILEE LECTURE:**

**Prof. Tarun Sourabdeep**

**Abstract**

LIGO-India: An Indian Mega-science venture

The historic discovery of gravitational waves through direct detection by the LIGO observatories in the USA, in principle, opens up a new window for astronomy. In practice, However, the full exploitation of gravitational-wave astronomy will await the global array of LIGO like observatories including the planned LIGO-India observatory. I will review the momentous discovery, the potential of gravitational-wave astronomy and the promise of LIGO-India.

## Foreign Scientist Speakers

- a. Prof. Dr. Thomas Geisen  
**Spectroscopy of the Heavens**  
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The physical processes and chemical reactions in space are reflected in the spectra of molecules that accompany and modify the lifecycle of stellar and interstellar matter. The recent developments in spectrometer technologies present at world-class observatories, in particular ALMA, SOFIA, and since recently the James Webb Telescope, provide astronomers with an enormous amount of spectral data. The physical meaning of such data is fully revealed only by comparative laboratory studies. Due to the increasing complexity of astrophysical spectra, a doubtless line assignment can only be ensured by high-quality laboratory measurements. It is to the merit of laboratory astrophysics groups worldwide that precise laboratory data for many interstellar molecules already exist and are available in freely accessible databases. With ever new technical developments, laboratory experiments are being adapted to the needs and questions arising from new astronomical observations, now and in the future. In this talk recent developments of the Kassel laboratory group will be presented and discussed.

**b. Prof. Dr. Tatiana Korona**

Quantum Chemistry Laboratory, University of Warsaw, L. Pasteura 1,  
02-093 Warsaw, Poland

Energy partitioning techniques for description of intermolecular and intramolecular interactions on example of complexes with calix[6]arenes with the Abstract:

Calixarenes - phenolic-based macrocycles consisting of repeated units of phenol and hydrocarbon groups - have attracted a lot of attention in recent years, owing to their ability to form host-guest complexes. Intermolecular complexes with calixarenes possess extraordinary properties resulting from a presence of multiple hydrogen bonds, which can either stabilize the calixarene macrocycle or to be used to form bonding with the partially confined smaller molecule. Multiple possibilities of the noncovalent bond formation, which can be favored or not depending on the guest type, make the complexes with calixarenes an ideal playground to partitioning techniques, which are supposed to determine which atomic groups within molecules play major roles in the interaction. To this end, we performed an extended study of complexes of calix[6]arenes and amino acids with help of symmetry-adapted perturbation theory (SAPT), functional-group SAPT (F-SAPT), and molecular fragmentation (MF) methods, in order to follow and understand changes of hydrogen-bond patterns, the number and strength of hydrogen and other noncovalent bonds, resulting from adding an amino acid to a calix[6]arene molecule (pristine or substituted with tert-butyl groups). A quantification of interaction between various groups performed with either F-SAPT, or MF reveals various interesting properties dependent on substituents and a host calixarene conformation. In particular, the relative energetic order of calixarene conformers is often modified upon the complexation. The interaction energy partitioning clearly shows the major pair (or pairs) of groups in calix[6]arene and the guest amino acid. Additionally, the analysis of the simulated IR spectra allows for a classification of the O-H bond stretching modes depending on their participation in the macrocycle of the hydrogen bonds. The intramolecular version of F-SAPT explains the weakening of some O-H bonds by the interaction of the hydroxy group with other hydroxy group (thus forming the H-bond) or with the phenol ring.



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**III**  
**ABSTRACTS OF**  
**SYMPOSIUM / INVITED LECTURES**



## **POLYMER NANOCOMPOSITES: SYNTHETIC STRATEGIES AND THEIR INFLUENCE ON PROPERTIES**

**Prof. Sunita Rattan**

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Amity University Uttar Pradesh, Noida, India*

### **Abstract**

Polymer nanocomposites has attracted a great deal of attention as sensing material because of their high simplicity and flexibility, owing to their interesting mechanical, thermal, chemical and electrical properties for a variety of applications [1]. Carbon based nanomaterials as nanofillers in polymer nano composites are highly attractive due to their ability to impart conductivity to the insulating matrix, along with providing excellent electrical and structural properties. Tremendous amount of work have been carried out on graphene based nanofillers (as expanded graphite, naographitic platlets (NGPs) , graphitic oxides (GO) etc) to fully exploit their potential in polymer nanocomposites [2,3].

The dominating factor in development of nanocomposites and realising the properties of the nanocomposites is the interface between the matrix and the filler. The interface controls the degree of interaction between filler and polymer and thus defines the mechanical and electrical properties of the polymer nanocomposites.[4-5] Thus, the properties of the nanocomposites can be fully realised if the interfacial region is extended through homogeneous dispersion and strong interfacial interaction.

The present talk deals with the dispersion of nanographite (NGP) into the polymer matrix for sensor applications. A substantial research is necessary to introduce a novel processing route which can provide strong interfacial interaction along with the complete exploitation of the NGPs within the polymer matrix. In an attempt to deliver such a material, we have demonstrated different strategies for the preparation of novel polymer nanocomposites such as macromolecular “click” cycloaddition route, Ion beam mixing and functionalisation through grafting [6-8]. These novel strategies facilitates the enhanced exfoliation of NGPs in polymer system which introduces a high density of interfaces in polymer nanocomposites resulting in significant increase in the flexibility, mechanical strength, durability, high carrier mobility and thus provide a useful material for sensor application The applications of the prepared



nanocomposites through these novel strategies as chemiresistive sensors for organic vapours will also be discussed.

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## **MICROWAVE FINGERPRINTS OF MOLECULES: FROM LABORATORY TO INTERSTELLAR SPACE**

**Prof. K P Rajappan Nair**

Visiting Scientist at Institute of Physical Chemistry,  
Leibniz University Hannover

and

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Molecular Physics, Manipal,  
Academy of Higher Education Manipal

### **Abstract**

Microwave spectroscopy has made a major role in elucidating accurate molecular structure and molecular interactions. It had its inception in 1934 with the historic experiments on the inversion spectrum of ammonia. Although best known for its ability to provide precise values of bond lengths and bond angles, microwave spectroscopy has also been one of the best means to obtain other molecular parameters such as dipole moments, nuclear quadrupole coupling constants, nuclear masses, molecular magnetic moments, low lying vibrational states, barrier to internal rotation, conformation and energy difference in rotational isomers and has helped extensively in the identification of known and unknown molecules. The fields of Radio astronomy and the laser itself have originated from studies in microwave spectroscopy.

The most important outcome of Microwave spectroscopic studies is its unique contribution for the beginning of laser era. It has made a major role in the origin and developments in masers which was the starting point or forerunner of laser. With the development of microwave spectroscopy Charles Townes and his co-workers working with ammonia spectrum in the microwave region observed that population inversion is possible in that molecule. This was in fact the beginning of laser era and later leading to laser cooling and to practical realization of Bose-Einstein Condensate.

The other contribution of microwave spectroscopy is in the identification of interstellar molecules, the subject is now termed Radio astronomy.

We have recently undertaken studies on many substituted toluenes and phenols at Leibniz University Hannover [1-14]. Fourier Transform Microwave Spectrometer built at the Physical Chemistry lab is being used

to investigate and the present talk is part of the work carried out at Hannover. The importance and need for research in this fundamental area of research will be illustrated and its applications in other fields especially in identifying interstellar molecules will be discussed.

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**GALAXY CLUSTERS: POTENTIAL CANDIDATES  
TO TEST PHYSICS OF EXOTIC OBJECTS**

**Prof. M.K.Patil**

**Abstract**

Galaxies are the building blocks of the universe and come in a variety of forms, shapes and sizes. They are “ecosystems” of the Universe that convert gas into stars and stars back into gas. Though our universe is comprised of billions of galaxies, they are not uniformly distributed in it. Instead they are seen in groups and clusters. Clusters are the densest aggregations of galaxies and contain up to thousands of galaxies bound together by gravity and could serve as excellent laboratories to investigate dark matter. Such clusters emit much of their energy in the form of X-ray bands making them the X-ray brightest extended sources. High resolution imaging and spectroscopic study of galaxy clusters using Chandra X-ray space telescope together with radio observations have revealed that the radiative cooling of X-ray emitting gas in the environment of such clusters is being offset by mechanical heating from the radio active galactic nucleus (AGN) at the core of cluster. This talk presents X-ray imagery of galaxy clusters that confirm mechanical heating of cluster environments by the radio jets and also highlight results based on the multi-wavelength study to check effectiveness of the AGN feedback in regulating cooling of the ICM and evolution of the source over the cosmic time.

## **MATTER AND MOLECULES IN ASTROPHYSICS**

**Prof. Shantanu Rastogi**

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Gorakhpur – 273 009

### **Abstract**

The visible astrophysical objects in the sky are usually too hot to allow molecules to exist.

Yet there is seemingly invisible matter between the stars that not only dims the light of background stars but also plays a major role in the formation, evolution and fate of stars. This interstellar medium (ISM) is dust and gas. The ISM is rich in molecules that play an important role in star formation and may also have pre-biotic significance. Observational detection of the ISM and the discovery of first diatomic molecules began in early nineteenth century. Today there are more than 200 molecules confirmed in the interstellar and circumstellar medium. A majority of these molecules are carbonaceous. Dust or solid matter plays an important role in molecule formation and its chemical evolution. The physical and chemical complexity of any astrophysical environment can be interpreted by the molecules detected in the region. There is also a whole group of polycyclic aromatic hydrocarbon molecules that are spectroscopically indicated in the interstellar space. Understanding the processes that induce growth of such large molecules lead to a better understanding of the physical and chemical state of the astrophysical environment. Molecules are also important in the study of atmospheres of exoplanets that may lead us to trace evidence of life and its evolution. The current status in the study of ISM pertaining to all these aspects will be reviewed and discussed.

**RECENT TRENDS IN MEDICAL INSTRUMENTATIONS USING  
MICROWAVES**

**Prof. Suresh C Mehrotra**

Professor (retired) and  
Ramanujan Geospatial Chair Professor,  
Dr. Babasaheb Ambedkar Marathwada University,  
Aurangabad (MS), India

**Abstract**

As response of microwaves with molecular systems is very sensitive to the interaction of water with other molecules present in biological systems, microwaves be useful to diagnose clinically the status of cancerous cells in human body. Water molecules in healthy tissues will behave differently than infected tissues. The information can effectively be used for diagnosis and treatment of diseases in human being.

The experimental technique of TDR will be presented in details for biological systems, as these systems have free charges which contribute to dc conductivity, along with relevant theoretical and experimental models.

The talk will also describe development of practical instrumentations using microwave

## **SETTLEMENT ON MARS: A FUTURISTIC APPROACH**

**Prof. Jagdish Rai**

(Former, Vice Chancellor, Invertis University, Bareilly, U.P. and  
Former Professor and Head of Physics, I.I.T. Roorkee,  
President, Stem Institute, Vishal Bhawan, Brahmarshi Nagar Colony,  
Akhari Bypass, Varanasi – 221011, U.P.)

### **Abstract**

The present talk discusses the ways of human settlement on Mars. The Martian atmosphere mostly consists of CO<sub>2</sub> and oxygen is in a very small amount. Some modern techniques like electrolysis using copper oxide nanowire modified tin oxide using solar energy (Schreier et al, 2017) or using high-energy ultraviolet laser (Lu et.al, 2014) and others can be used to convert Martian CO<sub>2</sub> in a small confined space for breathing by human being. The crater of Mars named LOMONOSOV is about 120 km deep and has the signs of tsunami in the past. Therefore, the deep soil must be having water. Taking algae and some bacteria from earth like *Bacillus Megatherium* NL-7 (Wu et. Al., 2017) the hard rock can be converted into soil making it nutrient for plants. Further, metals in the rocks can also be obtained by the same technique. Moon is known to contain abundance of Helium – 3. Helium-3 can be extracted from lunar soil for energy generation by cold fusion reaction. Using some well-defined techniques, this energy from moon can be transferred to Mars and can be utilized along with solar and wind energy. Eggs and tissues of animals from earth can be taken to Mars for reproduction through cloning.

The talk draws a complete road map for future settlement on Mars.

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## **LOWER LIMIT TO TIME REQUIRED FOR QUANTUM INFORMATION PROCESSING**

**Prof. P.C. Deshmukh [1,2]**

- [1] Department of Physics & CAMOST Indian Institute of Technology  
Tirupati, Chindapalle, District Tirupati, 517619,  
[2] Department of Physics, Dayananda Sagar University, Kudlu Gate,  
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### **Abstract**

Industry giants are engaged in a vibrant rivalry to achieve and excel in quantum supremacy in order to build quantum computers for applications in cyber-security, drug-design, portfolio management and financial modelling, artificial intelligence & machine learning, weather forecasting, logistics optimisation, etc. The societal impact of emerging quantum technologies would usher in the second quantum revolution based on information processing using qubits. This technology derives its strength from the mind-boggling phenomenology of entanglement which can enable quantum information processing at unprecedented speeds through smart manipulation of entangled qubits using multi-qubit quantum gates. The quantum algorithms are built using manipulation of unitary matrices but technology challenges are overbearing due to temporal processes involved in the minimal interactions involved in the operations of the physical qubits. In this talk, I shall discuss mechanisms that would be involved in determining the minimum time that would be required in quantum information processing. Analysis of this kind is expected to place upper bounds on the ultimate speed of quantum computer. We shall employ fundamentals of quantum collision dynamics to estimate these upper bounds.

**ROTATIONAL TEMPERATURE DETERMINED FROM SPECTRAL  
LINES OF MGH MOLECULE OBSERVED IN SUNSPOT SPECTRA**

**Prof. Subhash H. Behere**

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**Abstract**

The high resolution spectrum of the sunspots recorded by Wallace, Hinkle and Livingston on a McMath – Pierce Solar Telescope attached with the Fourier transform spectrometer show many bands of various molecular species, especially diatomic hydrides of Carbon, Calcium, and Magnesium etc. The rotational lines of the (0-0), (1-1), (2-2), (0-1), (1-2) and (2-3) bands of A  $^2\Pi^-$ - X  $^2\Sigma^+$  system A-X system of MgH are identified and their intensities are measured. The rotational temperature calculated using these measurements comes out as  $4245\pm 174$  K which is lower than the surface temperature of a sun as expected and comparable to other researchers.

**Key words:** Rotational temperature, Sun spot spectra, MgH molecule

## **FUNCTIONAL SURFACES TO NANOTECHNOLOGY AND “NANOBIO”**

**Prof. Shikha Varma**

Institute of Physics, Bhubaneswar  
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### **Abstract**

Surfaces Science and nanotechnology are used to manipulate matter on an atomic or molecular scale. They are also used to control the organization of technologically important objects into functional nanomaterials. Biomolecules, like DNA, offer many unique properties as controllable and programmable scaffolds. Interactions between biomolecules and inorganic materials present many unique challenges and play important role in the design of novel hybrid materials and sensors. Role of Nano-Biotechnology in removal and sequestration of pollutants like Hg and Arsenic via nano-bio scaffolds and organic hybrid platforms provides exciting opportunities.

## **DEVELOPING APPLICATIONS OF NANOPOROUS AEROGELS FOR ENERGY CONSERVATION**

**Prof. Neha Hebalkar**

International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Balapur PO, Hyderabad – 500005, [neha@arci.res.in](mailto:neha@arci.res.in)

Silica aerogel is known as world's most efficient thermally insulating material. The most attractive physical features of aerogels are its ultralow density, porosity as high as 99% and the pore size less than 100 nm, giving rise to the best thermal, electrical and acoustic insulation property in it. The applications are widespread due to these extraordinary properties in single material. However, being fragile in nature, these were unexplored for actual commercial applications for several years. We developed several forms of aerogel such as fiber-aerogel composites, granules, powders, monoliths and studied them for various thermal insulation applications in the domains of industrial, architectural thermal insulation, water purification etc.

The talk gives the highlights of the journey of this translational research and achieving the techno-commercially viable and globally competing products.

## **LITTLE BUGS WITH BIG DATA: APPLICATIONS IN HEALTHCARE**

**Prof Dr. Sharmila Mande**

FNAE Consultant as Advisor to TCS Research (Former Distinguished Chief Scientist, TCS Research) Tata Consultancy Service Ltd.

### **Abstract**

The diverse as well as complex microbial communities (called 'Microbiome') inhabiting within and around us play a significant role in our wellbeing. Like all matters, microbes are governed by laws of physics and chemistry that determine how they function. Recent advances in science and technology have enabled generation of enormous volume of complex Microbiome data. The most challenging part is to obtain knowledge from such 'Big data'. Computational methodologies are required not only for analysing these data, but also for performing computer simulations in order to predict the behaviour of the microbial communities under various environmental conditions. For example, metabolic simulations based on flux balance principles, can be performed for replicating the metabolic behaviour of an organism(s) under specific environmental conditions, such as under varying diet conditions. I will focus my talk on how the enormous volume of high throughput data, obtained while studying these tiny bugs, can be utilized for not only understanding their role in various diseases & disorders, but also coming up with novel ways of diagnosis and therapy.

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**IV**  
**ABSTRACTS OF**  
**ABSTRACTS OF ORAL PRESENTATIONS**



## **ANALYTICAL STUDY OF A T-SHAPED NANO ANTENNA**

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**Rashmi Rani**

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### **Abstract**

Recently nano antenna has emerged as an interesting field of research. It has enormous applications in broadband communications, imaging, sensing, energy harvesting, and diagnosis of diseases etc. Here a T-shaped nano-antenna is designed. The simulation has been done with the help of Advanced Design System (ADS) and results are compared with other nano antennas.

**Keywords :** T-shaped nano antenna, broadband communication, higher bandwidth.



## **ANALYSIS OF THERMAL TRANSPORT IN II-VI SEMICONDUCTORS**

**Richa Saini, Ankita R. Chuahan**

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Gurukul Kangri Deemed to be University, Haridwar-249404  
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### **Abstract**

The lattice thermal conductivity of II-VI group semiconductors is investigated on the basis of modified Callaway model. Using the double time Green's function approach based on many body theory, relaxation time of various scattering contribution have been obtained in the form of linewidth of phonon and electron. The scattering process namely boundary, impurity, phonon-phonon, electron- phonon and interference are the new features of formulation. The lattice thermal conductivity of four compounds from II-VI group have been analysed and a fairly good agreement between theory and experimental has been reported.

**Keywords:** Relaxation time, Linewidth, Thermal conductivity

## **THERMODYNAMIC PROPERTIES OF Al- Cu BINARY LIQUID ALLOY**

**Anil Kumar\*, S.K.Mandal\*\* and B. K. Singh \*\*\***

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### **Abstract**

A well established complex formation model is applied to compute the free energy of mixing, heat of mixing and entropy of mixing of AlCu liquid binary alloys in the molten state at 1373K at different concentration of the ingredients. The free energy of mixing is found minimum nearly 50% concentration means this liquid alloys are symmetric about equi-atomic concentration. The negative values of free energy of mixing indicate that this alloy in liquid state is weakly interacting system. The observed values of all the properties of mixing AlCu alloy in molten state are found in well agreement with the experimental data.

**Keywords :** Free energy of mixing heat of mixing, entropy of mixing and complex formation

**PHOTOLUMINESCENCE PROPERTIES OF EUROPIUM DOPED  
ELECTROSPUN STRONTIUM YTTRATE NANOFIBERS FOR  
SMART TEXTILE APPLICATION**

**Mahelaqua Haque<sup>#</sup>, Subhash B. Kondawar<sup>\*</sup>**

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**Abstract**

Europium doped Strontium Yttrate nanofibers (NFs) have been successfully synthesized by novel electrospinning technique.  $\text{SrY}_2\text{O}_4:\text{Eu}^{3+}$  NFs have an average diameter of 328 nm before calcination and 162 nm post calcination. TGA study reveals the thermal behaviour of  $\text{SrY}_2\text{O}_4:\text{Eu}^{3+}$  NFs which stabilises at 900 °C.  $\text{SrY}_2\text{O}_4:\text{Eu}^{3+}$  NFs are composed of Orthorhombic phase with *Pnam* spacegroup. Photoluminescence spectra was observed under 395 nm excitation and strong emission line is spotted at 612 nm which is characteristic electric dipole transition  $^5\text{D}_0 \rightarrow ^7\text{F}_2$  of  $\text{Eu}^{3+}$  ion. The CIE coordinates for  $\text{SrY}_2\text{O}_4:\text{Eu}^{3+}$  NFs appear in red region which makes it potential candidate for smart clothing applications.

**Keywords:** Electrospinning;  $\text{SrY}_2\text{O}_4$  nanofibers; Photoluminescence; Smart clothing

**108<sup>th</sup> INDIAN SCIENCE CONGRESS**  
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**Nagpur**

**V**  
**ABSTRACTS OF**  
**ABSTRACTS OF POSTER PRESENTATIONS**



**A REVIEW OF PEDAGOGICAL EXPERIMENTS FOR THE  
MEASUREMENT OF HEAT CAPACITY**

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**Abstract**

It is essential for students studying Thermal and Statistical Physics to understand the theoretical concepts pertaining to the measurement of the ratio of the heat capacities of gases, and the heat capacity of solids. This review article therefore describes Ruchardt's method, Rinkel's technique, which is a variation of the former, and acoustic interferometry or resonance. In addition, the paper elaborates on experiments to determine the specific heat of solid materials such as Power-Compensated DSC, Modulated Temperature DSC, which is a modification of the traditional DSC, AC Calorimetry via lock-in detection, and the thermal relaxation technique for thin samples.

**Keywords:** Pedagogical experiments, heat capacity, Differential Scanning Calorimetry, lockin detection, thermal relaxation

## **SYNTHESIS OF MN-NI-ZN FERRITE NANOPARTICLES BY SOL-GEL TECHNIQUE**

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### **Abstract**

$Mn_{0.5-x}Ni_xZn_{0.5}Fe_2O_4$  ( $x=0.0, 0.1, 0.2, 0.3$ ) ferrite nanoparticles were synthesized by sol-gel technique. The structural and magnetic properties were studied by using X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM) and Vibrational Sample Magnetometer (VSM) technique. The XRD patterns confirm the synthesis of single phase ferrite nanoparticles for all the samples. The lattice parameters were observed in the range of  $8.414\text{\AA} - 8.337\text{\AA}$ . The SEM images reveal the morphology of powder was porous and agglomerated. It has been observed that saturation magnetization increases up to  $x=0.1$  and then decreases.

**Keywords:** XRD; sol-gel; VSM, nanoparticles

## **A BASIC TOUCH-SENSOR SCREEN SYSTEM**

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Applied for membership for Indian Science Congress

### **Abstract**

The touch-sensor technology is about using our fingers or some other pointer, to view and manipulate information on a screen. On a conventional system, with every mouse click, the operating system registers a mouse event. With a touch-screen system, every time our finger touches the screen, a touch event is registered. A basic touch-screen system is made up of three components: 1. A touch sensor 2. Controller 3. Software driver The touch-sensor is a clear panel, which when touched, registers a voltage change that is sent to the controller. The controller processes this signal and passes the touch event data to the PC through a bus interface. The software driver takes this data and translates the touch events into mouse events. A touch-screen sensor any of the following five mechanics: resistance, capacitance, acoustics, optics and mechanical force. Today's thoughts are again around user interface. Efforts are being put to better the technology day-in and day-out. The Touchless touch screen user interface can be used effectively in computers, cell phones, web cams and laptops. May be few years down the line, our body can be transformed into a virtual mouse, virtual keyboard and what not?? Our body may be turned into an input device!

**Keywords:-** capacitive sensors, resistive sensors, acoustic sensor and other sensors etc.



**INTERATOMIC INTERACTIONS AND FIRST BRILLOUIN ZONE-  
CENTRE PHONON FREQUENCIES OF DOUBLE PEROVSKITE  
BA<sub>2</sub>MgWO<sub>6</sub>**

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**Abstract**

In the present study, we have proposed a six parameter bond-bending force constant theoretical model to simulate the zone centre phonon modes, for double perovskite structure compound Ba<sub>2</sub>MgWO<sub>6</sub>. The obtained results represent that the first neighbor interatomic interaction is stronger than the other interactions. Using the calculated inter atomic interactions up to third neighbor as input, we have calculated the zone centre phonon frequencies for the compound Ba<sub>2</sub>MWO<sub>6</sub> having double perovskite structure compound.

**Keywords:** Double perovskite structure, Raman and infrared phonons.

**NUMERICAL AND ANALYTICAL INVESTIGATION OF  
THERMOSOLUTAL CONVECTION IN A COMPRESSIBLE  
WALTERS'(MODEL B') ELASTICO-VISCOUS FLUID  
IN POROUS MEDIUM**

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**Abstract**

The thermosolutal convection in a compressible fluid through a porous medium is examined for viscoelastic polymeric solutions. These solutions are known as Walters' (model B') fluids and their rheology is approximated by the Walters' (model B') constitutive relations, proposed by Walters' (1962). The compressibility stable solute gradient is found to have stabilizing effect. The medium permeability has a destabilizing effect on the system. Also, the dispersion relation is analyzed numerically and the results shown graphically. For stationary convection, Walters' (model B') elastico-viscous fluid behaves like an ordinary Newtonian fluid. The oscillatory modes are introduced in the presence of stable solute gradient which were non-existent in their absence. The conditions for the non-existence of overstability are also obtained.

**Keywords** : Thermosolutal Convection, Elastico-Viscous Walters' (model B') fluid, Viscoelasticity, Compressibility, Porous Medium.

**ANALYSIS OF MAGNETIZED PLASMA ON ELECTROMEGNETIC  
WAVE PROPAGATING PARALLEL TO MAGNETIC FIELD**

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**Abstract**

In this study waves in plasmas provides significant information on plasma properties and is very useful in plasma diagnostics. This research is on analysis of Magnetized Plasma on Electromagnetic Wave Propagating parallel to magnetic field. Mechanical and electromagnetic waves are two important ways that energy is transported in the world around us. The actual speed of an electromagnetic wave through a material medium is dependent upon the optical density of that medium. Different materials cause a different amount of delay due to the absorption and reemission process. Properties of magnetized plasmas in the direction parallel to the magnetic field are different from those perpendicular to it. The motion of plasma parallel to magnetic field-lines is associated with dynamics of sound waves. Radio signals (which are the same form of radiation as light, ultra-violet, infra-red etc.) exist as a form of electromagnetic wave.

**A COMPREHENSIVE SURVEY ON PHYSICS  
IS A SUBJECT BASED ON CRITICAL NATURE**

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**Abstract**

In this paper I will merely concentrate on the critical nature of physics which I consider to be the most fundamental concept of science. Contrary to claims about the irrelevance of subjects in this nature, I argue that this critical idea had has, and still has, far more influence on physics than is commonly assumed. This work maintains that the current anti-critical nature ideology that had damaging effects on the fertility of this physics subject[1]. I also suggest that recent important empirical results in the physics field and the failure to detect super symmetry where many expected to find it, question the validity of this natural character of theoretical physics as well as experimental physics, providing towards engage in neat and clean critical reflection on natural scientific methods[3].

**MAGNETIC PROPERTIES OF NANOSIZED  
 $Mn_{0.5-x}Ni_xZn_{0.5}Fe_2O_4$  (X=0.0, 0.1, 0.2, 0.3)  
FERRITES SYNTHESIZED BY SOL-GEL METHOD**

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**Abstract**

The ferrite samples of  $Mn_{0.5-x}Ni_xZn_{0.5}Fe_2O_4$  ( $x=0.0, 0.1, 0.2, 0.3$ ) have been prepared by sol-gel method using chlorides of respective metal ions. The phase purity of the samples was investigated by XRD. The analysis of XRD patterns displays the formation of single-phase cubic spinel structure. It is found that lattice parameter decreases with increase in Ni content. It has been also observed that saturation magnetization increases up to  $x=0.1$  and then decreases with increase in Ni content.

**A VISION OF WOMEN DELEGATION  
BY SOLAR MECHANISM FOR VIABLE GROWTH IN INDIA**

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**Abstract**

In India where around 52% of the population is male and the remaining 48% are female, it is slightly less in comparison to the male population but it is around half of India's population. But then we see in most of the science and technology field women contribute very less compared to the males. It is very important to initiate for the women empowerment in the field of science and technology for economical and as well as for the sustainable development of India. We need to find ways to provide women with equal access STEM (science, technology, engineering, and mathematics), education, research opportunities, economic participation, which are considered to be fundamental requirements to fuel holistic growth, renewed and viable economy, and achieve sustainable development.

In the present work, we have studied the solar mechanism and it's an operation and then we study how it played the key role in women delegation for viable growth in India.

**Keywords:** *Sustainable development, women empowerment, solar sectors.*

## **RDRA, CDRA AND HDRA- A COMPARATIVE STUDY**

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### **Abstract**

In terms of percentage the bandwidth of RDRA, CDRA and HDRA are calculated as 56%, 50% and 46%. A comparative study of DRAs (RDRA, CDRA and HDRA) have been made in this paper. In this paper it is established that RDRA (in terms of parameters like impedance bandwidth, degree of freedom, resonant frequency - simulated and calculated) may be the better choice for further improvement in the design of Dielectric Resonator Antenna. The rudimentary geometries of DRA are rectangular, cylindrical and hemispherical, which are used for investigation of DRA performance. These rudimentary geometries of DRA give a better understanding of design parameters of an antenna and their effect on return loss, impedance bandwidth, benefit and resonant frequency. Thus it was found that the rectangular DRA provide better resonance level as compared to another geometries.

**Keywords:-** *RDRA, CDRA, HDRA, Impedance bandwidth, Resonant frequency, Degree of freedom.*

## THE DIELECTRIC PROPERTIES OF PMMA/ CDO NANOCOMPOSITE FILM

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### Abstract

The Frequency dependence of dielectric constant  $\epsilon'$  and dielectric loss  $\epsilon''$  of PMMA with composite of CdO polymer film are studied in the frequency range 50 Hz- 5 MHz. The experimental results show the PMMA with composite with CdO polymer films the dielectric constant increases with increased the temperature as well as frequency, and is due to greater freedom of movement of the dipole molecular chains within the polymer film at high frequency. The dielectric loss of PMMA and composite film of CdO polymer film frequency increases dielectric loss decreases, which indicates that the major contribution to the polarization comes from orientation polarization. And the a.c. conductivity of PMMA film its composite CdO polymer film shows that increases the temperature and frequency the a.c. conductivity increases anomaly at lower temperatures becomes more obvious with increasing the frequency and in composite film the CdO doping content, which probably corresponds to a basis electrode polarization effect. The film is characterized by using X-Ray diffractometer and to measured lattice parameter of PMMA with nanocomposite of CdO polymer film it has a cubic crystal structure of CdO.

**Keywords:** XRD, FTIR, SEM, Dielectric permittivity, A.C. Conductivity;



## LUMINESCENCE IN BISMUTH DOPED CAS PHOSPHOR

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### **Abstract**

Sulfide based phosphors have been studied for more than 100 years. Most of the prototype luminescent devices used sulfide phosphors through in later developments these have usually replaced by more suitable luminophors. In this paper simple method for preparing calcium based sulfide phosphors useful for solid state lighting is describe. Cas:Bi have been synthesized by the synthesis of sulfate re-crystallization method followed by reduction. Photoluminescence emission of CaS:Bi phosphor was observed at 448 nm could be excited efficiently by ultra-violet visible light in the 220-400nm range to exhibit highly efficient emission peak in the range of 400nm to 550nm. In addition the photoluminescence properties of Cas:Bi are also described.

**Keywords:** Sulfides, Photoluminescence, Solid State Lighting, Carbothormal Reduction

**EFFECT OF ETHANE BRIDGE AND ITS SURROUNDING RINGS ON  
THE PHYSICAL PROPERTIES OF SOME NEMATIC LIQUID CRYSTALS**

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**Abstract**

Five nematic liquid crystal (NLC) compounds have been investigated by polarizing optical microscopy (POM), molecular mechanics and dielectric spectroscopy. Introduction of ethane ( $-\text{CH}_2\text{CH}_2-$ ) bridge, its position, surrounding rings and fluorination were found to influence considerably molecular dipole moment ( $\mu$ ), inclination ( $\beta$ ) i.e., frame of reference, dielectric anisotropy ( $\delta\epsilon$ ), threshold voltage ( $V_{\text{th}}$ ), splay elastic constant ( $K_{11}$ ), relaxation time ( $\tau$ ) and activation energy ( $E_a$ ). Splay elastic constant ( $K_{11}$ ), an important parameter is found to vary from  $10^{-11}$  N to  $10^{-10}$  N. Comparatively lower value of  $K_{11}$ , lower value of restoring torque and alternatively faster response can be achieved.

**Keywords:** nematic liquid crystal; ethane bridge ( $-\text{CH}_2\text{CH}_2-$ ); threshold voltage; dipole moment; activation energy.

**EFFECT OF MOLECULAR CONFORMATION ON THE MESOGENIC  
PROPERTIES OF SOME PHENYL - TOLANE ISOTHIOCYANATE  
LIQUID CRYSTAL COMPOUNDS**

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**Abstract**

Effect of chain length and lateral fluorination on the molecular dipole moment ( $\mu$ ) and its inclination ( $\beta$ ), dielectric anisotropy ( $\delta\epsilon$ ), threshold voltage ( $V_{th}$ ), splay elastic constant ( $K_{11}$ ), relaxation time ( $\tau$ ) and activation energy ( $E_a$ ) of phenyl-tolane isothiocyanate compounds. In all the cases lower values of  $K_{11}$  were found ( $\sim 10^{-11}$  N) which are responsible for smaller values of restoring torque that means faster response. One strong absorption process has been observed within the measured frequency range. Smaller values of activation energies are found in smectic and nematic phases compared to fluorinated terphenyl isothiocyanates and fluorinated bicyclohexyl phenyl compounds.

**Keywords:** phenyl-tolane isothiocyanates; mesomorphic temperature range; dielectric anisotropy; splay elastic constant; dielectric relaxation.

## ON GRAVITATIONAL WAVES

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### **Abstract**

Gravitational waves are disturbances in the curvature of spacetime, generated by accelerated masses that propagate as waves outward from their source. Amplitude of gravitational waves is estimated roughly taking some value of energy emitted by a supernova. An equation of amplitude at a distance  $r$  from the source is obtained. The quadrupole amplitude of gravitational radiation by a binary system, polarization amplitudes, effect of inclination angle on polarization amplitudes, the shrinking of the orbit of binary system, chirp time are determined mathematically. The period decay for PSR B1913+16 and frequency of gravitational radiation from some stellar black holes are calculated mathematically.

**Keywords:** Gravitational waves ; General relativity ; spacetime ; metric tensor ; gravitational collapse ; amplitude ; supernova ; frequency ; binary chirp ; polarization ; black holes ; gravitational radiation.

## **SOLAR-OORT PROJECT**

**T. Bharti Mohan**

### **Abstract**

To observe our solar family in detail and to analyze the Oort cloud and Interstellar Space, we may conduct a ‘Solar-Oort Project’. According to this project, we have to embed two of our spacecrafts in the “Halley’s Comet’s trajectory” during its perihelion stage. The first spacecraft is to be released towards Oort cloud at the aphelion stage of comet Halley, so that it will observe and send data about the Oort cloud and Interstellar Space. The second spacecraft is to be moved along with the Comet permanently so that it will provide data about the objects of our solar family regularly-life long.

**Keywords** : Halley’s Comet, Oort Cloud, Space probes [or] Unmanned spacecrafts.

**ADSORPTION KINETICS OF ELECTROSPUN P-P HETEROJUNCTION  
NiCo<sub>2</sub>O<sub>4</sub>/PANI COMPOSITE NANOFIBERS FOR ROOM  
TEMPERATURE AMMONIA GAS SENSING**

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**Abstract**

Adsorption kinetics deals with the heterogeneous chemical reaction at solid-liquid interface. In another way it provides the interaction between adsorbate and adsorbent. The current article deals with the Langmuir adsorption kinetic equations and their simplifications for ammonia gas sensing. The equilibrium constant obtained describes the adsorption of ammonia gas molecule on the surface of material. The adsorption kinetic equation represents the straight line with slopes and intercepts used for determination of Langmuir adsorption-based theoretical response curves. Theory of adsorption kinetics for ammonia gas sensing and possible mechanism of gas sensing have been proposed for p-p heterojunction NiCo<sub>2</sub>O<sub>4</sub>/PANI composite nanofibers.

**Keywords:** Adsorption kinetics; electrospinning; nanofibers; gas sensing; polyaniline.

**IMPACT OF PRASEODYMIUM (PR<sup>3+</sup>) ION ON THE STRUCTURAL  
PROPERTIES OF CO-NI FERRITE SYNTHESIZED BY SOL-GEL  
AUTO-COMBUSTION ROUTE**

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**Abstract**

Rare earth Pr<sup>3+</sup> substituted Co-Ni nanocrystalline ferrite samples were prepared via the sol-gel auto-combustion technique, and sintered at 500 °C for 4 h in air. The sintering temperature of the samples was confirmed by the thermogravimetric with differential scanning calorimetry. The multiphase spinel ferrite of Pr-substituted Co-Ni ferrite was analyzed by X-ray diffractometry. The lattice constant is increased with doping of Pr<sup>3+</sup> in Cobalt-Nickel ferrites. The value of crystallite size lies within the range of 25-20 nm which confirms the nanocrystalline nature of the samples. The composition of different elements present in the sample was investigated by energy dispersive spectroscopy.

**Keywords:** Thermal decomposition; Structural properties; Sol-gel method.

**REVIEW ON DESIGNING RF ENERGY HARVESTING  
DEVICES FOR APPLICATIONS IN IOT**

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**Abstract**

An RF energy harvesting system provides a powerful solution to harvest the RF signals easily available in the environment to connect various wireless devices. This has led RF energy harvesters to find applications in many fields such as wireless charging/devices, wireless network systems, and IoT. The IoT applications are supremely based on long-range wireless connectivity sensors and actuators. Many technologies are deployed to enhance the efficiencies of these devices so that they have low consumption of energy with long-range connectivity. In this paper, we have discussed various challenges faced during the fabrication of an RF energy harvesting system with low consumption and wide-area connectivity. An attempt has been made to provide solutions for the development of such devices so that we can have a longer battery life to reduce the negative impact on the environment.



**GENERALIZED FORM OF NEWTON'S THIRD LAW IN FALLING AND REBOUNTING BODIES, CONSERVATION OF MOMENTUM, ONE DIMENSIONAL ELASTIC COLLISIONS; FIREWORKS, ROCKETS, ELECTRIC PLANE AND SOLAR PLANE, GLIDER AIRCRAFTS (PERLAN 2) ETC.**

**Ajay Sharma**

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**Abstract**

Newton's third law has numerous applications. For example in freely falling and rebounding bodies, various experiments regarding the law of conservation of momentum [  $M_p u_1 + M_t u_2 = M_p v_1 + M_t v_2$  ], applications of the law in a one-dimensional elastic collision. The equations based on the law neglect various significant factors e.g. shape, composition, size, asymmetrical nature of bodies, etc. even at the macroscopic level. If bodies of mass 1kg, the same material (spherical and flat shape) fall freely when dropped from a height of 1m from point A each has the same action (9.8 newtons) and reaction (9.8 newtons). Thus both bodies must rebound to the same height to point A. The spherical body may rebound to point A but the flat body does not rebound due to its typical shape. Thus the law is theoretically generalized, Reaction = - Action ( $K_{\text{shape}} \times K_{\text{composition}} \times K_{\text{target}} \times K_{\text{other}}$ ); the coefficient K takes into account all factors elusive to original form.

Tsiolkovsky's rocket equation ( $v = v_e \ln m_0/m$ ) is based on the third law (law of conservation of momentum), but this equation has not been quantitatively confirmed even for simple fireworks. **This equation is derived under hypothetical conditions, omitting certain factors, and has limitations.** The electric planes, solar planes, etc., and aircraft Perlan 2 (US Research glider) rise as high as 76,000 feet without emitting any exhaust. Tsiolkovsky's rocket equation is not applicable in such cases. So the motion of various flying bodies (horizontally and vertically) needs to be properly explained.

**Keywords :** Halley's Comet, Oort Cloud, Space probes [or] Unmanned spacecrafts.

## POTENTIAL RADIATION HAZARDS DUE TO TERRESTRIAL RADIONUCLIDES IN SOIL SAMPLES

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### **Abstract**

The radioactivity levels in the soil are one of the main sources of external gamma exposure. The risk of radioactivity affects human life directly. The natural radioactivity is mainly due to <sup>232</sup>Th, <sup>238</sup>U, and <sup>40</sup>K series. The mean activity concentration of <sup>226</sup>Ra, <sup>232</sup>Th, and <sup>40</sup>K was observed as 9.189, 20.176, and 94.464 Bq/kg, respectively which is below than allowed values of 35, 30, and 400 Bq/kg recommended by UNSCEAR-2000. Radiological hazard indices were evaluated through the computation of (R<sub>eq</sub>), (I<sub>γ</sub>), (H<sub>ex</sub>, H<sub>in</sub>), (D<sub>R</sub>) and (AED) and found these parameters lie well below the threshold limits. hence safe for the public health and environment. This confirms the soil of the study area is suitable for construction purposes.

**Key words:** Radiological hazards, Radionuclides, Dose rate, Gamma spectrometer, Soil.

## **PRESSURE DEPENDENT ELASTIC PROPERTIES OF EUROPIUM MONOCHALCOGENIDES**

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### **Abstract**

The pressure dependent ductile (brittle) nature of Europium monochalcogenides compound is computed by formulating an effective interionic interaction potential consisting the long-range Coulomb, the Hafemeister and Flygare type short-range overlap repulsion extended upto the second neighbor ions and the van der Waals (vdW) interaction. From the elastic constants the Poisson's ratio  $\nu$ , ratio  $R_{S/B}$  of  $S$  (Voigt averaged shear modulus) over  $B$  (bulk modulus) are calculated. It is noticed that  $\text{EuX}$  ( $X = \text{O}, \text{S}, \text{Se}, \text{Te}$ ) monochalcogenides are brittle at low pressures and ductile at high pressures in B1 phase and remain ductile at all pressures in B2 phase.

**Keywords:** Alloys, Pressure effects, Ductility, Mechanical properties

**PACS:** 71.20Eh; 61.50Ah; 62.20Fe; 62.20-x

## STUDY OF PHOTON SPHERE IN SPHEROIDAL SPACETIME

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### **Abstract**

We consider the occurrence of black hole from the collapsing perfect fluid configuration in the spheroidal spacetime. In this set up, the particular cases of black hole as an end state of continual collapse with exact solutions for the geometric spheroidal parameter  $K = -2$  and  $K = -7$  are explored for the formation of photon sphere. It is found that photon sphere does not exist in both the cases, and the divergence of effective potential at the origin rules out formation of a shadow of the black hole.

**Keywords:** Black hole, photon sphere, shadow of the black hole

**FRACTAL ANALYSIS OF GRAVITATIONAL WAVES AND NOISE IN AN  
INTERFEROMETER**

**Ms. Yashasvi Moon**

Ms. Yashasvi Moon<sup>1</sup>

Missouri State University, USA

and

Dr. Marco Cavaglia<sup>2</sup>, Missouri Science and Technology, USA

**Abstract**

This paper uses a new method to analyze waves and noise in a detector. A signal is associated with a particular fractal dimension. Computing this fractal dimension can help analyze signals better with greater accuracy. It can help identify noises due to earthquakes and predict when the detector is going into lock loss. This computed fractal dimension is then converted into frequency space by using Fourier Transformations. We are working on the applications for these now.

**Key words:** Fractal Dimensions, Fourier transformations

**STRUCTURAL CHARACTERIZATION OF CHEMICALLY DEPOSITED  
OF NANOCRYSTALLINE  $Cd_xZn_{1-x}S$  &  $Cd_xZn_{1-x}Se$  THIN FILMS**

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**Abstract**

The  $Cd_xZn_{1-x}S$  and  $Cd_xZn_{1-x}Se$  thin films are found to be sensitive to different impurities. So the deposition of stable  $Cd_xZn_{1-x}S$  and  $Cd_xZn_{1-x}Se$  films is a matter of considerable interest. These films also have pronounced annealing as well as ageing effects. The  $Cd_xZn_{1-x}S$  and  $Cd_xZn_{1-x}Se$  thin films have been successfully utilized in the fabrication of electronic devices. Structural parameters of  $Cd_xZn_{1-x}S$  &  $Cd_xZn_{1-x}Se$  thin films deposited on suitably cleaned glass substrates by chemical bath deposition technique at room temperature and normal pressure are studied using X-ray diffraction. The prepared  $Cd_xZn_{1-x}S$  &  $Cd_xZn_{1-x}Se$  thin films are found to be polycrystalline sphalerite in structure with preferred orientations along [111], [220] and [311] directions. The structural parameters of these polycrystalline thin films has been determined using different techniques. X ray line broadening analysis has also been carried out to obtain different structural parameter for fresh and annealed thin films. In the present paper the method of Williamson and Hall has been used to study the presence of the effect of size and strain on the x-ray line profiles of  $Cd_xZn_{1-x}S$  &  $Cd_xZn_{1-x}Se$  thin films. The variation of different structural parameters such as grain size and microstrain with thickness along with different substrate temperatures in fresh and annealed conditions have been reported.

**Key words:**  $Cd_xZn_{1-x}S$  &  $Cd_xZn_{1-x}Se$  thin films, grain size, microstrain, x ray line profile.

**PROBING COLD DARK MATTER THROUGH GRAVITATIONAL TIME  
DELAY BY GRAVITATIONAL FIELD OF GALACTIC HALO**

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**Abstract**

**Dark Matter, Flat Rotation Curve and Gravitational Time Delay**

The flat rotation curve of galaxies indicates the presence of large amounts of dark matter in the galactic halo region. The cosmological observations suggest that the dominant part of the dark matter is cold. The space-time geometry of the halo region in the presence of cold dark matter is significantly different from the Schwarzschild geometry. In the present work, we derive the expression for gravitational time delay of a particle with non-zero mass due to the gravitational field of the galactic halo. It is found that the functional form of time delay due to cold dark matter led halo is quite different from that due to Schwarzschild space-time with or without dark matter.

**EFFECT OF GAMMA-RAY IRRADIATION ON MORPHOLOGY AND  
ANTIMICROBIAL ACTIVITY OF GREEN SYNTHESIZED SILVER  
NANOPARTICLES**

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**Abstract**

Metal silver nanoparticles have been known from the ancient ages due to their unique physical properties and their medical applications for antimicrobial and anticancer therapy. In the current study silver nanoparticles are synthesized using the green synthesis method. Silver nanoparticles were synthesized using Neem leaf extract. Synthesized silver nanoparticles were irradiated using a Co-60 gamma irradiation source at doses of 1kGy,2 kGy, and 3 kGy. Green synthesized silver nanoparticles were characterized before and after Gamma ray irradiation using UV-Vis spectroscopy, SEM, and FTIR Spectroscopy. Antimicrobial activity of silver nanoparticles observed before and after gamma-ray irradiation.

**Keywords:** Green synthesis, Antimicrobial activity, gamma ray irradiation.



## **STRUCTURAL AND ELECTROMAGNETIC PROPERTIES OF NANO ZNO FOR MICROWAVE APPLICATION**

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### **Abstract**

ZnO nano-sized particles were prepared by high energy ball milling (HEBM) method. The structural and electromagnetic shielding effect of nano-ZnO ceramics was evaluated in this experiment. Field Electron Scanning Electron Microscope (FESEM) analysis was obtained to study the surface morphology and average grain size of nano-ZnO ceramic pellet. X-ray diffraction (XRD) was employed for understanding the phase structure of nano-ZnO ceramics. Vector Network Analyser (VNA) was used to study the scattering parameters ( $S_{11}, S_{12}$ ) in X-band region (8-12GHz) and the study of electromagnetic behaviour of nano-ZnO ceramic pellets were also shown. Reflection coefficient was measured to be -10.71dB in nano-ZnO ceramics due to its large surface area, more interconnected dipoles and more grain size. So nano-ZnO ceramics have better reflecting characteristics which creates a scope of application in reflecting electronic devices.

**Keywords:** Zinc Oxide, Electromagnetic shielding, Reflection coefficient, Transmission coefficient

**EFFECT OF ETCHING ON FORMATION OF 90° DOMAIN  
IN KNbO<sub>3</sub> SINGLE CRYSTAL**

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**Abstract**

Domain study is a very useful tool to explain ferroelectric materials. Potassium Niobate (KNbO<sub>3</sub>) ferroelectric crystals were doped with Fe. This Fe - doped KNbO<sub>3</sub> ferroelectric crystal further chemically etched with methyl alcohol. Trinocular microscopy method was used to verify the observations on domains. In this work, 90° domains, domain walls and domain boundaries were observed. Brief mechanism of forming 90° domain structure and domain wall discussed in this paper.

The grown samples of Fe doped KNbO<sub>3</sub> single crystal were etched with methyl alcohol which produces dislocations in crystals. These dislocations help for the nucleation of domains. Similarly, after the imperfection or dislocations in crystal, an impurity dipoles were created which play major role in nucleation of new domains. When dipole is formed, oxygen leaves in the form of ions. The 90° domains were observed when KNbO<sub>3</sub> crystals etched with methyl alcohol.

**Keywords:** Domain studies, Domain Wall, 90° domains.

## **A FRACTAL PERSPECTIVE TO ELECTRODEPOSITS AND ELECTROLESS DEPOSITS**

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### **Abstract**

The concept of fractal and fractal geometry has broadened new horizons in characterization of irregular shapes. Different fractal models proposed are found to be very useful in explaining complexity of irregular shapes that could not otherwise be quantified. Artificial fractals of metals were developed in laboratory using electrodeposition and electroless deposition techniques. Electrodeposition under certain operating condition results in formation of dendritic patterns showing scaling behavior and fractal characteristics. Also electroless deposits so obtained are of dendritic nature. In this present study electrodeposits of copper and zinc were developed from aqueous solution of copper sulphate and zinc sulphate and the effect of different cell operating conditions, different concentrations, temperature etc. on the growth of fractal were studied. The electroless deposits of lead and nickel were developed from aqueous solution of lead acetate and nickel sulphate. The effect on growth of fractals due to different concentration were studied. The characterization of dendritic patterns at different stages of development in terms of fractal dimension is carried out by specially designed techniques. It is shown that obtained deposits possess self-similarity and scale invariance and have fractal character.

**Keywords:** - DLA, electrodeposition, electroless deposition, fractal, fractal dimension, fractal geometry, self-similarity, scale invariance.

**IMPACT OF SULPHUR CONTENT ON STRUCTURAL PROPERTIES  
OF AGIN(SSE) THIN FILM**

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**Abstract**

The AgIn(SSe) thin film were prepared by two step process consisting of high vacuum sequential deposition of precursor film having stack [Glass/(In/Ag/Se) × 4 folds layer by layer deposition using electron beam technique followed by sulphurization at 550°C for 30min various sulphur contain in tubular furnace under varied argon gas pressure from 50 to 600 mbar. The X-ray diffraction studies revealed similar diffraction pattern with a preferred orientation along (112) plane, confirms single phase quaternary compound. SEM image confirms that film at 75mg sulphur content shows of closely packed grains, with a uniform morphology and no voids. Raman analysis using multi wavelength excitation confirms the growth of single phase AISSe.

**DYNAMICS OF COUPLED HENON MAP ON  
DIFFUSION LIMITED AGGREGATE**

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**Abstract**

Coupled map lattice has been studied on d-dimensional Euclidean lattice and on complex networks. It has also been studied on Sierpinski Gasket which is a deterministic fractal. In this work, we study coupled map lattice on diffusion limited aggregate (DLA), a random fractal. The map we make study from the viewpoint of the Henon map. The number of neighbors for a given site may range from 1-4 in case of a DLA. Two possible cases arise where the sum of weights remains constant or not. The bifurcation diagrams we make study of differ in both the scenarios.

## A RKR<sub>V</sub> AND HULBERT-HIRSCHFELDER POTENTIAL ENERGY CURVES FOR GROUND STATE OF RuN MOLECULE

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### Abstract

The spectrum of  $F^2\Sigma^+ - X^2\Sigma^+$  system of RuN molecule have been recorded at high resolution in the region 12 000–35 000  $\text{cm}^{-1}$  using a Fourier transform spectrometer. The rotational structure of some bands belonging to  $F^2\Sigma^+ - X^2\Sigma^+$  transition of RuN have been analyzed which led to accurate rotational and vibrational constants of ground and excited states. The molecular constants derived in this analysis are used for the construction of RKR<sub>V</sub> and Hulbert- Hirschfelder (H-H), potential energy curves. The error curves show that the H-H potential energy functions match fairly well to RKR<sub>V</sub> Curve.

**Keywords:** Potential energy curve, Diatomic molecule, Hulbert-Hirschfelder potential

## **SYNTHESIS AND OPTICAL CHARACTERIZATION OF NANO STRUCTURED ACID-DOPED POLYANILINE THIN FILMS**

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### **Abstract**

Polyaniline has attracted tons hobby amongst researchers due to its moderately exact conductivity, balance, ease of practise, affordability and redox homes in comparison to different natural compounds. In this work, Polyaniline (PANI) skinny movies have been synthesized with the aid of using chemical oxidative polymerization of aniline withinside the presence of Hydrochloric acid the use of Ammonium peroxydisulfate as an oxidizing agent. The synthesised (PANI) skinny movies, doped with Tetraoxosulphate VI acid (H<sub>2</sub>SO<sub>4</sub>) and Citric acid, have been characterized the use of UV-Vis spectroscopy (UVJASCO V-670) to analyze the versions withinside the optical homes. The skinny movies have been discovered to be of the equal thickness (0.2µm) and their absorption spectra discovered absorption peaks at round 300nm and 650nm for the natural (PANI) and the pattern doped with Citric acid whilst that doped with H<sub>2</sub>SO<sub>4</sub> had its peaks at 300nm and 880nm. Doping decreased the direct band hole of the (PANI) from 2.75eV to 2.4eV.

**Keywords:** Polyaniline skinny film, natural compounds, chemical oxidant polymerization, synthesized polyaniline, optical properties.

## **BANDWIDTH ENHANCEMENT TECHNIQUES OF THE DUAL BAND PATCH ANTENNA**

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### **Abstract**

In this paper a new antenna configuration with dual element offering dual band frequency with a controllable of frequency ratio of the two elements and a novel dual microstrip antenna wide bandwidth is presented. Simulations and measurements on the new proposed antenna configuration have provided a useful design for a wideband width MPA of 9% or with a controllable frequency separation of the two frequencies of the dual-element with  $f_2/f_1 = 1.38:1$  for the given construction.

**Keywords** :- Microstrip antenna, wide bandwidth, antenna configuration etc.



## **DUST PROBLEM EVEN IN CLOSED ROOM**

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2 - Dept of Biochemistry P.U. Patna.

### **Abstract**

Dust is a biggest problem even in closed room. Visual observations were taken with the help of simple microscopic lances. Simple hand lance, simple slides, watch glass, cover slips and some diluting materials were used to determine the rate of emission of dust and the amount dust which is harmful to the mankind. After the various observations the main reasons assumed that the modern building materials are responsible for the creating dust is coming out from the walls. First of all the invisible particle were emitted by the corneal layers of surrounding walls. Which were formulated by the unionization of invisible particles into visible particles? It is a need to use material which will be the dust preventing.

**Key words** – dust proof materials, dust and corneal layer.

## **TRI-HYBRID ELECTRICITY GENERATION METHOD FOR EV CHARGING STATION BY USING MFC, SOLAR AND WIND ENERGY**

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**Mrs.Shweta Mahendra More**

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*Applied for Membership*

### **Abstract**

This paper reviews Microbial Fuel cell, Solar & Wind energy. First objective is to discuss microbial fuel cell. Second objective is to put forth various experiments done by me in generating electricity through microbial fuel cell. Till now majority of Microbial Fuel cell are using graphite as anode and cathode separated by Proton exchange membrane. I have used Graphite and Magnesium as electrodes for generating electricity in single chamber without any membrane. This MFC can be used for various applications. Also a new concept of generating electricity with solar panels and using the area beneath it for generating energy with MFCs, while at the same time a small wind turbine while be used as a third hybrid electricity generating partner. This technology can revolutionize the current energy production method. Also the reason behind bringing this technology into light is to show that it is green, free, hazard free, flexible, compact and unending availability. One can generate electricity at home for own consumption. This generated energy is going to be utilize for charging of Electrical vehicles at different places.

Microbial cell is a very easy and simple method to get energy from soil. This battery generates voltage of 1.5 to 1.8 volts. It is totally green and renewable. This energy can be used to turn on led lights, buzzers, calculators, digital watches etc. Tomorrow we may see this energy being used in many Gadgets( as energy requirement for electronics devices getting reduced day by day).

This paper is a result of 7 years of research and development, trial and error and infinite ideas.

**Keywords:** Microbial fuel cell, Renewable energy, Free energy, perpetual energy, non-conventional energy, EVCS Electrical Vehicle Charging Station.

## **ROLE OF OXIDIZING AGENT ON FERRITE DOPED POLYANILINE**

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### **Abstract**

Ferrites doped polyaniline (PANI) was successfully synthesized by *in-situ* chemical oxidative polymerization method. Synthesized samples were characterized to understand structural (XRD), morphology (SEM), electrical (AC and DC) and dielectric parameters. XRD pattern reveals broad peak of pure PANI and sharp peaks of ferrite ( $\text{Ni}^{2+}$  &  $\text{Cu}^{2+}$ ) doped PANI. The effect of oxidizing agent was observed in conductivity as temperature increases the conductivity of sample decreases and same was also observed in frequency dependent conductivity. Dielectric studies showed that ferrites doped polyaniline will have dielectric behavior as like the ceramic material. These materials may find application in energy storage device.

**Keywords:** Ferrites/PANI, Oxidizing agent, AC and DC conductivity, Dielectric behavior

## DISSOCIATION ENERGIES OF BeH, MgH, CaH AND SrH MOLECULES

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### **Abstract**

Few diatomic hydrides like MgH, CaH and CH have an astrophysical significance as they are observed in sun spot umbra. An experimental and theoretical studies of these molecules are therefore important. Dissociation energy is one of the important parameters in spectroscopy. An attempt is made in present study to calculate the dissociation energies of BeH, MgH, CaH and SrH molecules using the potential energy curves of their ground states. An anharmonic oscillator model and the fundamental definition of dissociation energy are used to develop the procedure. The results agree with the reported values of dissociation energies in literature.

**Keywords:** Sun spot spectra, Dissociation energy, BeH, MgH, CaH and SrH molecules.

**THE STUDY OF APERTURE COUPLED DUAL BAND DIELECTRIC  
RESONATOR ANTENNA FOR S BAND**

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**Abstract**

A dual band integrated dielectric resonator antenna for S band is presented in this paper. It is the combination of cylindrical ring with polygon shaped slot antenna. The ring is excited by an aperture coupled feeding technique. The Ansoft HFSS simulation software is used for simulation work. The software results show that the proposed radiating structure is operated at two frequencies 2.9 GHz and 3.7 GHz. The bandwidth is 1.21 GHz and the the minimum return loss for two frequencies is 40 dB and -32 dB respectively. The gain obtained is 4.9 dB and 5.0 dB respectively. The proposed antenna is applicable for S band and Wi-max applications.

**Keywords:** Dielectric resonator antenna, dual band, aperture coupled, cylindrical ring.

## STRUCTURAL AND OPTICAL INVESTIGATIONS OF LANTHANIDE ACTIVATED $\text{Bi}_2\text{SiO}_5$ NANOPHOSPHOR

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### Abstract

Bismuth Silicate ( $\text{Bi}_2\text{SiO}_5$ ) crystal belongs to Aurivillius family and received considerable attention because of their potential applications in catalysis, solar cells, luminescence, photocatalytic activity, nanodevices, sensors, heavy metal removal like Cr ion etc. In the present work we have synthesized series of  $\text{Dy}^{3+}$ ,  $\text{Eu}^{3+}$  and  $\text{Tb}^{3+}$  ions doped and co-doped  $\text{Bi}_2\text{SiO}_5$  nanophosphors were synthesized by hydrothermal, combustion and co-precipitation methods. Various structural characterizations were made using X-ray diffraction (XRD), Scanning electron microscopy, transmission electron microscopy etc.  $\text{Bi}_2\text{SiO}_5$  crystalline phase analysis was confirmed by XRD technique of size  $\sim 20$  nm. We have explored the various vibrational and optical properties including FTIR, Raman, absorption, photoexcitation and emission of synthesized samples. The energy bandgap of the undoped sample was estimated to be  $\sim 3.7$  eV, which is bit higher than the reported bandgap, which represent blue shift which attributed due to the quantum confinement was observed. Photoluminescence spectra exhibit various sharp transitions of  $\text{Dy}^{3+}$ ,  $\text{Eu}^{3+}$  and  $\text{Tb}^{3+}$  ions and bright emission in yellow (576 nm), red (611 nm) and green (546 nm) region was reported, intensity of which is found to be function of host composition, annealing temperature, active ion concentration, PH and co-doping of lanthanide ions. When a trace amount of Dy also present with Tb and Eu ions, a whole range of emission observed in 480-850 nm, due to efficient energy transfer from Dy to Eu, and Dy to Tb ions. For selected excitation two way energy transfer and dual channel energy transfer was observed.

**Keywords:**  $\text{Bi}_2\text{SiO}_5$ ; Photoluminescence; Energy Transfer; Nanophosphor

**AN ESTIMATION OF DIELECTRIC CONSTANT AND PROPERTIES  
DEPENDENT ON IT BY USING TDR AT ROOM TEMPERATURE.**

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**Abstract**

The dielectric measurements have been carried out for the propionaldehyde-ethanol binary mixture in the frequency span of 10 MHz-50 GHz at room temperature for the concentrations from 0%-100% of propionaldehyde in ethanol. The complex permittivity spectra was measured and dielectric constant values for entire compositions has been found out, and the dielectric properties that depends on dielectric constant eg; excess permittivity ( $\epsilon^E$ ), Kirkwood correlation factor ( $g^{eff}$ ) and bruggeman factor ( $F_B$ ) were also determined.

**Keywords:** Dielectric properties, Dielectric Constant, Kirkwood factor, Time domain reflectometry

## **LAGRANGIAN FORMULATION OF OUTER AND INNER CORES OF EARTH AND AXIGRA**

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### **Abstract**

Axigra a combination of axion and graviton, plays a role in both the inner and outer covers of Earth. The outer core of liquid state and the inner core of solid material, have iron, Nickel, Sulphur and Magnesium apart from minor metals that are negligible. Axigra splits as spin half and photon of spin one, termed as spo-half and pho-one for outer core and spi-half and phi-one for the inner core of Earth.

Lagrangian formulation yield three equations for  $\psi_0$ ,  $A$  and  $\psi_0$  where represents "axigra" mass  $m_A$ , and  $\psi_0$  and  $\psi_0$  stand for the four major elements mentioned above.

**Keywords:** Axigra, Axiom, Gravitin, Lagrangian Formulation



## **SYNTHESIS OF CALCIUM FLUORIDE NANOPARTICLES BY CHEMICAL ROUTE FOR ULTRASONIC INVESTIGATIONS**

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### **Abstract**

The main objective of this research work is to synthesize calcium fluoride nanoparticles by the chemical route and to measure the ultrasonic velocity, density, and viscosity of methanol-based calcium fluoride nanosuspension. The prepared calcium fluoride (CaF<sub>2</sub>) was characterized by X-ray Diffractometer (XRD) analysis, Scanning Electron Microscopy (SEM) and it is found that the average particle size is of the order of 48 nm. Ultrasonic velocity measurements were carried out by the Interferometer technique operated at 1 MHz frequency at a low concentrations varied from 0.002 to 0.1 wt/vol% of calcium fluoride nanoparticles in methanol at a temperature 25°C to 40°C. It helps in finding out many other acoustical parameters such as adiabatic compressibility, acoustic impedance, free volume, free length, and relaxation time. All these acoustical parameters are highly reflect the information of interaction that occurred between Ca<sup>2+</sup> ions and dispersion medium(methanol). It is observed that ultrasonic velocity increases with an increase of nanoparticles weight fraction in methanol, and shows a peak at a concentration of 0.002 wt/vol% and deep at a concentration of 0.006 wt/vol%. It may be due to the ion-dipole interaction between Ca<sup>2+</sup> ions and methanol molecule, which is strong.

**Keywords:** Calcium fluoride nanoparticles; X-ray Diffractometry; Scanning Electron Microscopy; Ultrasonic velocity; ion-dipole interactions.

## **SOUND ABSORPTION STUDIES IN BIODEGRADABLE WASTE**

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### **Abstract**

Biodegradable materials are found to have more acoustic absorption properties because of their porous structural properties which helps reduce noise levels. Smart absorbing materials (biodegradable materials) can be utilized for different applications such as to make biodegradable and recyclable sound absorbing materials. Here we studied the sound absorption properties of an orange peel (OP). Samples were prepared by cleaning & drying process and were undergone hydrolysis. OP surface of sample were studied by SEM. Brunauer-Emmett-Teller (BET) surface area of particles are also studied, showing, it has good porosity and can be excellent sound absorber.

**Keywords:** Characterization, fruit peel, solid waste, detrimental, ultrasonic mercerization, BET, Cavitation.

**ACOUSTIC STUDY OF SOME ANCIENT TIME SITES IN MADHYA  
PRADESH (INDIA)**

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**Abstract**

In the present study we have compared acoustic evaluation of Udaigiri caves (Vidisha) in Madhya Pradesh and Bhojeshwar temple (Bhojpur) in India. For the study we have used zoom H3-VR (a 4 channel ambisonic recorder) to record all impulse response. WE have also studied room acoustic parameters like reverberation time, clarity etc. FET analysis of each measurement gives many resonances peak. It is concluded that the Bhojpur temple SNR value is low as compared to Udaigiri caves it means that noise level is more in temple as compared to caves but strength, centre time parameter is significant for temple.

**Keywords:-** Archaeoacoustics; reverberation time; room acoustics; Udaigiri caves; Bhojpur temple

**STUDY OF ENHANCEMENT OF ULTRASONIC VELOCITY AND  
THERMAL CONDUCTIVITY IN COPPER OXIDE NANOFLUID**

**Shivani Pantawane, P. V. Tabhane , O. P. Chimankar**

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**Abstract**

Nanofluid is nanoparticles suspended in base fluid like water, ethylene glycol, oil etc. The present study was aimed to prepare CuO nanofluid using wet chemical method. Ultrasonic Characterization along with XRD and SEM has been done. The Thermal conductivity is measured by using KD2 Pro thermal Conductivity Analyzer which indicates that there is a significant increase in thermal conductivity of the prepared copper oxide nanofluids compared to deionized water.

**Keywords:** Nanofluids, CuO, Sodium Hydroxide, Ultrasonic velocity, SEM, XRD, Thermal conductivity.

**UNDERSTANDING OF PHOTOLUMINESCENCE PROPERTIES OF  
EUROPIUM DOPED  $\text{Sr}_2\text{Al}_2\text{SiO}_7$**

**Tripti Richhariya<sup>1</sup>, Nameeta Brahme<sup>2</sup>, D. P. Bisen<sup>2</sup>**

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<sup>2</sup>SoS in Physics and Astrophysics, Pt. Ravishankar Shukla University,  
Raipur, India-492010

**Abstract**

In this study series of trivalent europium doped  $\text{Sr}_2\text{Al}_2\text{SiO}_7$  phosphors have been done via conventional solid-state reaction method. For structural characterization X-ray powder diffraction pattern is done, which suggest the phase formation of desired phosphors. Photoluminescence studies have been done and reveals that the optimum intensity is obtained at 3 mol% doping concentration of  $\text{Eu}^{3+}$ . Chromaticity co-ordinates and correlated color temperature of optimized concentration is calculated and compared with the commercial red phosphors. This reveals that the synthesize phosphors may act as potential candidate for the development of red light.

**Keywords:** Photoluminescence,  $\text{Eu}^{3+}$ , XRD, CIE co-ordinates

**BIOLOGICAL FRACTALS AND MORPHOLOGICAL CHANGE IN  
BACTERIAL COLONIES**

**Kranti Zakde<sup>1</sup>, Nazneen Akhtar<sup>2</sup>, Surekha Munde<sup>3</sup>, Pradnya Ingle<sup>4</sup>,  
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**Abstract:**

The collection of patterns and shapes in nature has long been a source of joy and wonder to laymen and scientists alike. Discovering how such patterns emerge spontaneously from an orderless and homogeneous environment has been a challenge to researchers in the natural sciences throughout the ages. Many phenomena display the emergence of patterns during diffusive growth, ranging from the growth of snowflakes to solidification of metals, from the formation of a coral reef to cell differentiation during embryonic development. Alan Turing understood that patterns would evolve in systems driven out of equilibrium, where competition and interplay between various tendencies exists. We realized that the diffusion field drives the system towards decorated (on many length scales) irregular fractal shapes. Here we describe cooperative patterning during growth of bacterial colonies a standard modelling approach was developed by combining a detailed study of the cellular behaviour and dynamics during colonial development and invoking concepts derived from the study of pattern formation in non-living systems. Keywords: fractal, fractal shapes, diffusion, bacterial colonies etc.

## POTENTIAL RADIATION HAZARDS DUE TO TERRESTRIAL RADIONUCLIDES IN SOIL SAMPLES

**Abdu Hamoud Al-Khawlany\*<sup>1</sup>, A. R. Khan<sup>2</sup>, J. M. Pathan<sup>3</sup>,  
Ifrah Fatema<sup>4</sup>**

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### Abstract

The radioactivity levels in the soil are one of the primary sources of external gamma exposure. The risk of radioactivity affects human life directly. The natural radioactivity is mainly due to  $^{232}\text{Th}$ ,  $^{238}\text{U}$ , and  $^{40}\text{K}$  series. In the current study, the collected soil samples from Aurangabad-India have been analyzed by using NaI(Tl) detector. The mean activity concentration of  $^{226}\text{Ra}$ ,  $^{232}\text{Th}$ , and  $^{40}\text{K}$  was observed as 9.189, 20.176, and 94.464 Bq/kg, which is below than permissible values of 35, 30, and 400 Bq/kg recommended by UNSCEAR-2000. Radiological hazard indices were evaluated through the calculation of  $R_{\text{eq}}$ ,  $I_{\gamma}$ ,  $H_{\text{ex}}$ ,  $H_{\text{in}}$ ,  $D_{\text{R}}$  and AED. These parameters lie well below the threshold limits hence safe for public health and environment.

**Key words:** Radiological hazards, Radionuclides, Dose rate, Gamma spectrometer, Soil.

**NEWTON'S FIRST AXIOM OR LAW OF MOTION AND  
CONTRIBUTIONS OF PRECEDING SCIENTISTS**

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**Abstract**

Aristotle (384BC-322BC) initiated a study of the motion of the body that rest is the natural state of the body; continuous external force is needed to set bodies in motion and maintain motion.

Avicena (980-1037) stated that '*nobody begins to move or comes to rest of itself*' which is a qualitative statement. Its first part is simply Aristotle's assertion.

Galileo (1564-1642) in *Letters on Sunspots* in 1612 implied that the body possesses the inherent property to move (with uniform velocity in a straight line) without an external mover, if not impeded by an external obstacle. Galileo maintained that no force is needed to maintain the motion of bodies (practically true in ideal systems).

Descartes (1596-1650) in 1644 in the book *The Principles of Philosophy* re-stated Galileo that the body always persists in the same state if once moved continues to move. It was earlier stated by Galileo, 32 years before. In 1673, Huygens in Hypothesis I also referred to Galileo's acuties.

Then Newton in 1686 in the masterpiece *The Principia*, re-quoted the existing perceptions ( of Aristotle and Galileo) as the first law of motion (if 'forces impressed' do not act then the body perseveres state of rest or uniform motion).

Newton simply edited Aristotle's and Galileo's perceptions of the first law of motion without acknowledging the original contributors.

**Keywords** : First law , Galileo, Avicena , Huygens, Newton.



**SYNTHESIS AND CHARACTERIZATION OF BAFE11.8LA0.2O19  
M-TYPE HEXAFERRITE BY STANDARD CERAMIC METHOD**

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1B. T. Borkar, 1G. C. Vandile**

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**Abstract**

The aim of the paper is to improve the standard ceramic method for the synthesis of hexaferrite, After the discovery of hexagonal ferrite or hexaferrites, it has been become important materials commercially and technically to study which is still growing on. In this article, we have reviewed about the M-type hexaferrite including their structural, synthesis techniques and important magnetic properties. M-type Barium Hexaferrite with substituted of Trivalent Lanthanum ions (La<sup>+3</sup>) substituted BaFe<sub>11.8</sub>La<sub>0.2</sub>O<sub>19</sub> were synthesized by standard ceramic method. The pallet have been heated on temperature for 1150°C for 3 hour. It has been heated upto 72 hour. The characterization by using various instrument techniques. The structural studied of the sample were studied by using X-ray Diffraction (XRD), and Scanning Electron Microscope (SEM) Vi. XRD shows hexagonal magneto-plumbite (M) type structuring and having unit cell dimension 'a' and 'c' varies between 6.0509Å to 21.1745Å.

**SYNTHESIS OF HEXAGONAL FERRITES SrFe<sub>11.9</sub>La<sub>0.1</sub>O<sub>19</sub> AND ITS CHARACTERISTICS BY SOLID STATE METHOD**

**1 S. R. Choubey, 2A. B. Borkar, Srushti. V. Kathawate, 1B. T. Borkar, 1G. C. Vandile**

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**Abstract**

The characterization and magnetic structural properties of Strontium Hexaferrite with doped Lanthanum (SrFe<sub>11.9</sub>La<sub>0.1</sub>O<sub>19</sub>) has been prepared by Solid-State Method. The pellets have been melted on temperature 1150°C for 3 hours. It has been heated upto 72 hours. For structural study, X-ray Diffraction (XRD), Scanning Electron Microscopy(SEM), Vibrating Sample Magnetometer (VSM) and magnetic properties were performed. We observe the hexagonal crystal structure of Strontium Hexaferrites refined from X-ray single crystal data and also observed peak value of angle  $2\theta$  is  $10.000^\circ$  for 1150°C. XRD shows hexagonal Magnetoplumbite (M) type structure having unit cell dimensions 'a' and 'c' varies between 6.02 Å and 15.76Å. By using SEM technique we observed the topography and morphology of samples.

## INTERPRETING THE CHARACTERISTICS OF LATERAL SHOWER AGE OF PROTON-INITIATED COSMIC RAY SHOWERS

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### **Abstract**

A simple analytical argument is proposed for a possible interpretation of the characteristics of the lateral shower age ( $s$ ) of proton-initiated showers. The analytical argument states that lateral density distribution (LDD) of electrons of a p shower is due to superposition of several electromagnetic (EM) sub-showers developed at a very early stage in the atmosphere from the decay of neutral pions ( $\pi^0$ ). Thanks to the superposition property of the electron LDD in a p shower, a plausible analytical parameterization has been worked out by giving well represented analytic function for the electron LDDs of p- and  $\pi^0$ -initiated showers. Based on air shower simulations, we have validated how the various characteristics of  $s$  can be understood employing the analytical argument. The  $s$  parameter of a p shower and its correlations with the shower ages of electron- and  $\pi^0$ -initiated showers supports the idea that the result of superposition of several EM sub-showers initiated by  $\pi^0$  s with varied energies at a very early stage might produce the LDD of electrons of a p shower.

**Keywords:** *simulation, cosmic-rays, EAS, lateral shower age, interactions*

## PARAMERIZATION OF DECELERATION PARAMETER IN F(Q) GRAVITY

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### **Abstract**

In this article, we investigate the modified symmetric teleparallel gravity or  $f(Q)$  gravity, where  $Q$  is the non-metricity, to study the evolutionary history of the universe by considering the functional form of  $f(Q) = \alpha Q^n$ , where  $\alpha$  and  $n$  are constants. Here, we consider the parametrization form of the deceleration parameter as  $q = q_0 + \frac{q_1}{z} (1+z)^2$  which provides the desired property for sign flip from a decelerating to an accelerating phase.

We get the solution of the Hubble parameter by examining the mentioned parametric form of  $q$ , and then we impose the solution in Friedmann equations. Employing the Bayesian analysis for the Observational Hubble data (OHD), we estimated the constraints on the associated free parameters  $(H_0, q_0, q_1)$  to determine if this model may challenge the  $\Lambda$ CDM limitations. Furthermore, the constrained current value of the deceleration parameter  $q_0 = -0.832^{+0.091}_{-0.091}$  shows that the present universe is accelerating. We also investigate the evolutionary trajectory of energy density, pressure, and EoS parameters to conclude the accelerating behavior of the universe. Finally, we try to demonstrate that the considered parametric form of the deceleration parameter is compatible with  $f(Q)$  gravity.

**Keywords:**  $f(Q)$  gravity; Accelerated expansion; deceleration parameter; EoS parameter; Cosmic chronometer dataset; Observational constraint

**NEWLY SYNTHESIZED CU DOPED CORE@SHELL QUANTUM DOT:  
XRD AND SPECTROSCOPIC STUDIES**

**Altaf Husain and Sanjeev R. Inamdar\***

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. \* Prof. Sanjeev R. Inamdar, E-mail: him\_lax3@yahoo.com,

**Abstract**

CuInS/ZnS quantum dots were synthesized using simple aqueous technique. The typical synthesis of CuInS core formation consisted InCl<sub>3</sub>, CuCl<sub>2</sub> and GSH as main precursors of AR grade. Zn(OAc)<sub>2</sub> and Na<sub>2</sub>S are used to incubate shell over the core. The molar ratios of Cu: In: GSH are maintained at 1:4:20 at 90 °C reaction temperature at pH 8.5. The XRD results confirmed the cubic phase with particle size approximately 1.66nm (JCPDS No.047-1370). DebyeScherrer, Williamson-Hall plot and size-strain plot methods adopted to validate XRD results. Steady state measurements carried out in order to utilize the QDs for sensor applications.

**Keywords:** Core@shell, D-S plot, W-H plot, SSP method, Photoluminescence, Tauc plot.

**INVESTIGATE CHARACTERISTIC ELECTRIC-DIPOLE TRANSITIONS  
OF EU<sup>3+</sup>-ION DOPED SR<sub>1-x</sub>AL<sub>2</sub>O<sub>4</sub> VIA CO-DOPING OF TRANSITION  
METAL ION**

**Dr. Praveen Kumar Litoriya<sup>a,\*</sup>, Ashish Verma<sup>a</sup>**

<sup>a</sup>Department of Physics, Dr. Harisingh Gour Vishwavidyalaya, Sagar  
(A Central University), M.P., India, Pincode-470003.

**Abstract**

In this paper we report the photoluminescence behavior of rare earth and transition metal doped Eu<sup>3+</sup> doped Sr<sub>1-x</sub>Q<sub>0.10</sub>Al<sub>2</sub>O<sub>4</sub>: Eu<sub>x</sub> (x=0.05) (Q= Ba, Ca, Mg ) synthesized by urea fuel combustion method. The XRD analysis shows that the sample to be single phased in nature and it was found to have crystallized into monoclinic phase with standard JCPDS 34-0379 card. Scanning electron microscopy (SEM) & Transmission electron microscopy (TEM), confirm the formation of nano particle, with average particle size around 6- 25 nm. The elemental composition was confirmed by using Energy Dispersive X-ray (EDX) technique. The oxide formation was examined via FTIR technique. UV-Visible spectroscopy is used to study the optical band gap of material, it's value in the current case, Sr<sub>1-x</sub>Al<sub>2</sub>O<sub>4</sub>: Eu<sub>x</sub> (x=0.05) is 3.78eV. The photo-luminescence study revealed that it gives broad emission spectra using excitation wavelength  $\lambda_{ex} = 394$  nm. It is observed that the Eu<sup>3+</sup> doped Sr<sub>1-x</sub>Q<sub>0.10</sub>Al<sub>2</sub>O<sub>4</sub>: Eu<sub>x</sub> (x=0.05) (Q= Ba, Ca, Mg) phosphor can be regulated as orange-red emission with the high color temperature and good colour purity. The spectra are intense and lie in the visible range. The visible watt value and CRI are excellent for prepared material. The orange-red lights can regulate the circadian rhythm through melatonin, and it is also suitable for orange-red LED and other optoelectronic devices.

**Keywords:** *Combustion method, Phosphor, structural and photoluminescence properties, red emission, CCT & CRI, optoelectronic devices,*

**GENERAL PHASE BEHAVIOR OF AMPHIPHILE-WATER SYSTEMS:  
A THEORETICAL STUDY**

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**Abstract**

In the present report, we have introduced a simple one scalar order-parameter Ginzburg-Landau theory for binary mixtures of water and amphiphile. The scalar order parameter describes the amphiphile concentration. Phase diagrams are calculated by minimizing the free energy functional. Several ordered lyotropic phases such as body centered cubic (BCC) & hexagonal phases both direct (I) and inverse (II) and lamellar phases were found to exist. The phase diagrams show the sequence of ordered phases: body centered cubic (BCCI) - Hexagonal (HI) - Lamellar (L<sub>α</sub>) - Hexagonal (HII) - body centered cubic (BCCII) with increasing amphiphile concentration, commonly observed in such systems.

**OPTICAL PROPERTIES OF ZNO NANOPHOSPHORS SYNTHESIZED BY  
SIMPLE, ONE-STEP SOLID STATE REACTION METHOD**

**Rajesh Kumar, Dr. Sheo K. Mishra<sup>1\*</sup>**

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dr.sheokmishra@gmail.com (Sheo K. Mishra)

**Abstract**

In the present work, we have investigated optical properties of Zinc-Oxide (ZnO) nanostructures synthesized by simple, one-step solid state reaction method. Structural and morphological investigations have been performed by X-ray diffraction (XRD) pattern and scanning electron microscopy (SEM). XRD result confirms the formation of hexagonal wurtzite structure of ZnO. No additional peak of by-products such as Zn(OH)<sub>2</sub> etc have been seen in the XRD pattern. The average crystallite size of synthesized ZnO nanostructures corresponding to most prominent peak is to be ~84.67 nm. In optical properties, FTIR and photoluminescence (PL) spectroscopy of ZnO nanostructures synthesized by simple, one-step solid state reaction method have been investigated. The obtained results suggest that the synthesized ZnO nanostructures are suitable for optoelectronic applications.

**Keywords:** ZnO, FTIR, XRD and Photoluminescence.



**POSTULATES OF NEWLY IDENTIFIED APPARENT MOTIONS OF  
GALACTIC TILTING AND THE DEDUCED NEW ACTUAL TILT  
CAUSING SUCH OBSERVATION OF GALACTIC TILTING,  
AS SEEN FROM EARTH**

**Swapan Kumar Rudra**

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**Abstract**

From the Photographs of Night Sky I identified that our galactic disc has a Tilting Motion against its diametrical axis towards its complete Revolution of  $360^\circ$  in our 365 day, as it is apparently viewed from Earth. The definite causes for such views have also been deduced by me as Postulates.

The postulates will provide new identification and proof that in addition to Earth's Tilted Axis of  $23.5^\circ$ , the plane of Earth in solar system has an angle of Tilt of  $54.1^\circ$  (approx.) with our galactic plane.

**108<sup>th</sup> INDIAN SCIENCE CONGRESS**  
**3 – 7 January, 2023**  
**Nagpur**

**VI**  
**LIST OF**  
**PAST SECTIONAL PRESIDEDNTS**



**PAST SECTIONAL PRESIDENTS**

**PHYSICAL SCIENCES**

Santhosh Chidangil	2020	S. S. Kapoor	1994
Vijay janardhan Fulari	2019	C. K. Majumdar	1993
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Jagdish Rai	2016	M.I. Savadatti	1990
V. P. Mahadevan Pillai	2015	D. K. Rai	1989
Sanjeev R. Inamdar	2014	S. P. Khare	1988
A. K. Rai	2013	V. S. Nanda	1987
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V. K. Rastogi	2011	Vachaspati	1985
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**PHYSICS**

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Ran B. Singh	1995	B.V. Thosar	1969
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F.C. Auluck	1967	<b>MATHEMATICS AND PHYSICS</b>	
W.M. Vaidya	1966	K.P. Ramanathan	1939
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R.N.Ghosh	1950	C. V. Raman	1924-23
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D.S. Kothari	1944	Rev.D.Mackichan	1917
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