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Abstract Book

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Department of Physics

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KEYNOTE ADDRESS

Self-Powered, Broad-Band Photodetectors on Paper Substrates

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Self-powered photodetectors are devices that can convert radiant energy to electrical signals without the need for an external power source or battery. Typically, self-powered photodetectors are realized via the separation of photoexcited electron and holes are either separated using pn-junctions, Schottky junctions, using a photoelectrochemical cell-type, piezo- or and pyro-phototronic types. In my talk I will be discussing about device architectures which operate based on the disparity in the magnitude of carrier diffusion coefficients of photogenerated electrons and holes in the photoabsorber.

TALKS

1. Quantum Decoherence and Equillibration of Quantum Systems

Adarsh S., P.N. Bala Subramanian, **Sreeraj T.P.**

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Most quantum systems decohere. Most systems equillibrate. We investigate the connection between these two generic phenomena.

2. Lattice Formulation of $GL(4,\mathbb{R})$ Gravity

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In the search for a fundamental theory unifying general relativity and quantum

mechanics, lattice gauge theory is seen as a promising renormalization scheme. Here, we try to find a lattice formulation of gravity, where gravity is treated as a gauge theory and the corresponding gauge symmetry is given by the $GL(4,\mathbb{R})$ group. We take the position that the whole of the dynamics of the theory is inherent in the internal space. We expect to see the emergence of the spacetime in some small energy limit of the theory. We find the action, and hence the Lagrangian. Then we attempt to find the Hamiltonian formulation of the theory.

3. Janus MXenes as Efficient Catalysts for Sustainable Ammonia Production

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The nitrogen reduction reaction (NRR) presents a promising alternative to the Haber–Bosch process for ammonia production, owing to its milder reaction conditions. Metallic two-dimensional materials have emerged as promising catalysts for various reactions, including the NRR. Catalysts play a crucial role in determining NRR efficiency, with MXenes emerging as potential candidates. This study investigates the performance of Janus MXene-based catalysts for NRR. Density functional theory computations were conducted to evaluate various Janus MXenes. Effective activation of the triple bond in N_2 is essential for efficient NRR catalysis. Our findings show that Janus MXenes can effectively elongate the N_2 bond by 0.23Å, with Janus MoWC exhibiting noteworthy catalytic activity. Specifically, the basal plane of MoWC MXene demonstrates superior catalytic performance while effectively suppressing the hydrogen evolution reaction with an overpotential of 0.40V.

4. On the Quantization of FLPR Model

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We quantize the Friedberg-Lee-Pang-Ren (FLPR) model, using an admissible gauge condition, within the framework of modified Faddeev-Jackiw formalism. Further, we deduce the gauge symmetries and establish off-shell nilpotent and absolutely anti-commuting (anti-) BRST symmetries. We also show that the

physical states of the theory are annihilated by the first class constraints which is consistent according to the Dirac formalism.

5. Tamm Plasmon Mediated Tunable Absorption Switching in Atomically Precise Pt_{17} Nanoclusters for Nonlinear Photonic Applications

Athulya K.S., Nikhil P.P., Jatinderbir Singh, Chandrasekharan K.

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Metal nanoclusters, created with atomic precision, are an exceptional class of ultra-small molecule-like functional materials with wide applications in nonlinear nanophotonics. These ultra-small clusters exhibit intriguing quantum size effects, leading to discrete energy levels and size-dependent optical and electronic properties. The effective integration of nanoclusters in photonic structures can improve their nonlinear optical properties by promoting stronger light-matter interaction. In this paper, we demonstrate Tamm cavity induced nonlinear optical characteristics of ligand protected platinum-17 metal nanoclusters. The spectral tunability of the Tamm resonance mode is explored by controlling parameters such as the number of bilayers, spacer layer thickness, and metal characteristics. The nanosecond nonlinear optical studies demonstrate excellent nonlinear absorption properties, attributed to the coupling of Tamm plasmons with the nanoclusters. Notably, a switching behavior in the intensity-dependent absorption coefficient is observed at resonant and off-resonant excitations, suggesting potential applications in optical switching and tunable nonlinear filters.

Keywords : Tamm Plasmon Cavity, Metal Nanoclusters, Platinum-17, Nonlinear Absorption, Z-Scan.

6. Holygrass "Darbha" Derived Multifunctional Carbon Dots Incorporated Biodegradable Food Packaging Films

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Indian economy is mainly depending on agriculture, so food preservation and packaging have a crucial role in maintaining better health. The practice of eating meals in banana leaves, offering puja nivedyam in banyan leaves, distributing prasadam in leaf plates and adding Darbha grass in fermentable food during the eclipse days are common Indian practices1.On the other hand, westernization and industrialization have triggered us to use disposable plastic packaging materials as they are more convenient to handle. Eventhough they are disposable in nature they contains carcinogenic agents and are unsafe for health and surroundings and create a burden to our environment as a major pollution contributor2.The attributes of toxic-free nature, better water solubility, biocompatibility, stability, and tunable surface functionalities of Darbha-derived carbon dots (DCDs)incorporated in biodegradable polymer packages will be safer choices over non-biodegradable plastic food packages3.Here in this work, we are developing eco-friendly carbon dots from holy grass-"Darbha" via a simple and cost-effective method. Biodegradable DCDs functionalized with polyvinyl alcohol (PVA) (DCDs/PVA composite) as biocompatible food packaging will be fabricated and their physicochemical abilities will be evaluated. Moreover, the proposed food packages will add economic benefits to farmers and awareness to preserve Indian grassy fields.

Keywords : Active Packaging; Carbon Dots; Darbha Grass; Eco-Friendly; Non-Carcinogenic; Sustainable.

1. Raj, D.S., et al. (2015) '*Hierarchical Nanofeatures Promote Microbial Adhesion in Tropical Grasses: Nanotechnology Behind Traditional Disinfection*', BioNanoScience, 5(2), pp. 75–83.

2. Muncke, J. (2021) '*Tackling the toxics in plastics packaging*', PLoS Biology, 19(3), pp. 1–11.

3. Gedda, G., et al. (2023) '*Green synthesis of multi-functional carbon dots from medicinal plant leaves for antimicrobial, antioxidant, and bioimaging applications*', Scientific Reports, 13(1), pp. 1–9.

7. Bridging Trails in Reflectionless Potential Deformation: Two Paths and One Horizon

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SUSY, in quantum mechanics, has a remarkable feature by which one can generate isospectral deformed potentials. For a given potential, the isospec-

tral deformation enables one to cultivate a totally different family of potentials which may not be the supersymmetric counterparts of the original potential but have identical reflection and transmission coefficients. There are mainly two methods to generate isospectral deformed potentials, which are the conventional method of translation and a novel class of scaling methodology. Translation generates a one-parameter class of isospectral deformation whereas scaling introduces three-parameter in the first iteration itself. Thus we can calculate the two- and three-parameter classes of isospectral deformation of the well-known reflectionless potential scaling methodology. The reflectionless potential is one of the exactly solvable potentials and also a solution to the prominent nonlinear KdV equations. From the above-mentioned results, we will find that the three-parameter class of deformations is not unique but instead subsumes in the same class of conventional one-parameter translational deformation. I can also provide a theoretical foundation for how these two incredibly different approaches converge at the same destination. Finally, I will show that the most generic class of potentials, obtained by scaling deformation, are solutions of the nonlinear KdV equation.

8. Entanglement Entropy in Gauge Theories

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In Quantum Information theory, Entanglement Entropy (EE) is a very useful measure of entanglement between a system and its environment. However, the definition of entanglement entropy becomes ambiguous for Gauge theories. In this talk, we will attempt to address these ambiguities by utilizing methods from lattice formalism of gauge theories.

9. Leveraging Light: Precision Control and Navigation of Micro-Particles Using Metasurfaces

B. Aravind, V. Shanto and N. Yogesh

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Metamaterials are specially engineered periodic materials that are designed to produce properties that are not naturally occurring in normal materials. We'll

explore how Metasurfaces can be used to manipulate light to produce vortex beams to manoeuvre micro-sized particles, ultrathin planar lenses for focusing applications, and darkfield generation for optical trapping applications. The concept of Coded Metasurfaces which are central in producing structured light and tailored radiation, is used to propose a method to design a Metasurface array that generates spatial patterns with dark field (opposite to concentrated electromagnetic fields).

10. Talbot Metasurfaces for Beam-Focusing Applications

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In this work, a method for realizing a focusing metasurface through the manipulation of the Talbot effect has been demonstrated. We have developed two chiral metasurface configurations capable of transforming linearly polarized light into right and left circularly polarized light at 4.913 GHz. The structure is thin, with a size of $\lambda/19.87$ at the operating regime. These structures exhibited the Talbot effect when arranged into arrays of 30x30 unit cells and illuminated with linearly polarized light at normal incidence. When light is incident on the arrays, it exhibits the characteristics of a two-dimensional diffraction grating, creating the Talbot carpet. By incorporating array patterns that include both left and right polarizers, we successfully altered the properties of these diffraction gratings at the interfaces where the two polarizer types intersect. After investigating the periodic arrangement patterns, we successfully modified the Talbot effect to generate focused microwave beams at 4.913 GHz frequency. This technique can be used in other parts of the electromagnetic spectrum and applications, such as imaging and sensing.

Keywords : Talbot Effect, Metasurface, Microwave, Chiral Metasurface.

11. Why do we hype about hyperbolic metasurfaces?

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(1a, 1b and 1c contributed equally)

The dispersion of conventional isotropic or anisotropic media is generally circle or ellipse respectively. These closed dispersion contours impose a limitation on the allowed propagation modes in the media. On the other hand, a hyperbolic medium has open hyperbolic dispersion contours and supports higher propagation modes resulting in applications such as wave manipulation and high resolution imaging. Hyperbolic metamaterial is a periodic arrangement of metals and dielectrics that exhibit hyperbolic dispersion. In simple terms, it acts as a metal in one propagation direction and as a dielectric in another direction. However, it is highly bulky and lossy as well as difficult to fabricate. A hyperbolic metasurface is a simpler two dimensional version of the same which overcomes the aforementioned limitations. In this work, a novel geometry for hyperbolic metasurface is designed and attempts are made to realize in-plane focusing of TM polarized light using it.

POSTERS

1. Visible Light Induced Depolymerisation of Polyethylene Terephthalate

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We aim to develop and demonstrate a cost-effective technique to depolymerize plastic to smaller fragments or to its corresponding monomer/monomers. Visible-light-induced depolymerization is used as the defragmentation process, and the polymer selected for the study is polyethylene terephthalate (PET). In the absence of additives, PET is transparent to visible light, and thus a photosensitizer is identified in this work, that has the ability to absorb the visible radiation from the light source. Weight loss of PET is investigated by using three different photosensitizers; TiB_2, MgB_2 and graphite with high boiling point using blue laser

(visible light) of wavelength 450 nm and power 5W. It has been observed that all photoactive materials show broadband light absorption in the UV-Visible range, weight loss of PET is observed only with MgB_2. To confirm that this weight-loss was due to depolymerisation of PET, Gas Chromatography-Mass Spectrometry (GC- MS) characterization of PET degradation fumes is conducted and higher area percentage of terephthalic acid (monomer) was observed, confirming the depolymerization of PET during the process. The method introduced in this work implies its higher applicability in sustainable development as a cost-effective and efficient plastic-degradation tool.

2. Enhanced Catalytic Activity in Nb-Doped TiO_2 for Electrochemical Oxygen Reduction Reaction

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TiO_2 has wide applications in catalysis and photocatalysis and is an attractive alternative to Pt or Pt-based catalysts due to its abundance, low cost, and non-toxicity. However, it does not display any worthwhile catalytic activity as far as the Oxygen Reduction Reaction (ORR) is concerned. Attempts have been made to improve the activity of TiO_2 by doping and creating defects on the surface. Nb-doped TiO_2 is experimentally found to have good conductivity and electrochemical activity for low Nb concentrations. This paper presents a systematic modeling study of how Nb doping influences the ORR activity of anatase TiO_2 using plane wave DFT method. We elucidate the probable dopant sites, the effect of Nb doping on the oxygen binding capability at active sites, the favored reaction pathway and the transition state. We find a remarkable enhancement in the capability of TiO_2 to catalyze ORR upon doping with Nb. We have also modeled the effect of solvation on the binding of oxygen and other reaction intermediates, using a model where water molecules are added as a monolayer over Nb-doped TiO_2. Solvation introduces additional hydrogen bonding, which improves the binding of intermediates to the active site and lowers activation barriers. Our model for ORR in Nb-doped TiO_2 agrees with recent experimental results on the same.

3. Cavity-Assisted Fluorescence Enhancement of Graphene Quantum Dot Nanostructures

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This article delves into the realm of photonic crystal cavities, engineered to manipulate and enhance fluorescence signals. Photonic crystal cavities effectively confine and amplify emitted light, offering a promising avenue for advancing sensing and imaging technologies. The study details the synthesis of graphene quantum dots using a facile laser irradiation method and the creation of a photonic crystal cavity structure incorporating graphene quantum dots. The resultant structures are characterized, revealing enhanced photoluminescence properties that are better than or on par with reported results. The article explores the principles governing these phenomena and highlights the potential applications in improving fluorescence-based sensing sensitivity and selectivity.

4. The Electronic Structure Calculations of Quaternary Heusler Alloys FeRhCrZ (Z= Ge, Si, Sn)

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The theoretical prediction of half metallicity, ferromagnetism and spin gapless behaviour of Heusler compounds have a significant role in understanding and designing new materials for various spintronic applications. They are more attractive due to their stable half metallicity with high Curie temperature and compactible lattice structures with existing spintronic devices. The electronic structure calculations of FeRhCrZ (Ge, Si, Sn) alloys shows the half metallic ferromagnetic nature with a total magnetic moment of $12\mu B$/unit cell. The tunable electronic structure properties with both spintronic and topological features opens up the possibility of a new kind of material in both fundamental and applied perspective.

5. Optothermofluidic Metallic Nanoparticle Patterning and its Application in Particle Assembly

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Vertical lifting process is a conventional particle patterning technique to realize large-area patterning for photonic crystal fabrication and electronic device applications. Though this method is exploited for uniform deposition over large area, inscription of desired patterns over the substrate with control of the morphology remains a challenge. Recently, light-controlled flow based patterning has gained increasing attention since it allows non-contact, real-time patterning. Herein we demonstrate a template-free technique for the precise patterning of metallic nanoparticles by the synergy of optically controlled thermocapillary flow and vertical lifting method. The principle relies on the accumulation of particles near the liquid meniscus that is in contact with a solid substrate due to light-induced thermocapillary flow and controlled lifting of the substrate out of the liquid. We have conducted both experimental and simulation studies of the developed patterning technique. We have achieved various patterns, such as continuous lines, intermittent lines and cross patterns, etc. by modulating the lifting velocity, laser irradiation time, and lifting direction. Further, we demonstrate the applicability of the developed line pattern to realize large-area assembly of non-absorbing microparticles.

6. Quasi Periodic Pulsation due to Shock Wave in CME

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Quasi-periodic pulsations (QPPs) in solar and stellar flares pose a persistent enigma in solar physics due to their unclear origins. This paper investigates the potential connection between coronal mass ejections (CMEs) and the generation of QPP, particularly focusing onobservations within the white light wavelength of the K-corona. Uti-lizing data from the ground-based Mauna Loa Solar Ob-

servatory, the study conducts thorough data analysis to explore the occurrence and effects of CMEs. Notably, a post-CME shock wave emerges as a candi-date mechanism driving QPP, as evidenced by distinctive features in the observed light curve. Employing the global wavelet transform technique, the study identifies an eight-minute oscillation associated with the shock wave, hinting at a potential link between magnetoacoustic waves in the corona and the observed QPP phenomena. the study contributes to clarifying the origins of QPP by identifying the post-CME shock wave as a potential driver of this phenomenon. By analyzing data from ground- based observations, the research establishes a connection between CME events and the subsequent occurrence of QPP, thus addressing a long- standing question in solar physics.

7. Study of Heavy Ion Fusion Evaporation Process in Mass 220 Region

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Heavy-ion fusion evaporation reactions are important topic of reseach in nuclear physics as they are the established pathway for producing superheavy elements (SHEs). According to the compound nucleus (CN) hypothesis the dinuclear system formed in fusion takes a long dynamical path that equilibrates in all degrees of freedom or causes it to reseparate like fission. The CN becomes different evaporation residues (ER) when it de-excites through particle evaporation or gamma emission and survives fission. Formation of these ERs depends on the capture probability, CN formation probability, and its survival probability against fission. It was found that, various parameters such as mass, energy, nuclear dissipation, shell closure etc., may influence the formation of the ERs. However the exact dependences of these parameters on the fusion evaporation processes are not clearly understood. Considering the aforementioned facts, we have performed the statistical model analysis of the measured ER cross section for ^{16}O+^{203}Tl, ^{16}O+^{205}Tl reactions leading to the formation of ^{219,221}AcCNs. The experimental ER excitation functions were measured using Hybrid Recoil mass Analyzer (HYRA) at Inter University Accelerator Centre (IUAC), New Delhi. The fusion cross-secion as well as the fusion spin distributions were simulated using CCFULL fusion code. The decay of the CN were performed using the Monte Carlo code VECSTAT.

8. Investigating the Entrance Channel Effect in Fission Dynamics of ^{216}Ra Compound Nucleus Via Pre-scission Neutron Multiplicities

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The mechanism underlying the collective rearrangement of nuclear matter in heavy ion fusion- fission is a hot topic of research. Neutron multiplicity may provide complete dynamical information of the fusion-fission from the touching configuration to the scission point. Statistical model analysis has been performed for the experimental neutron multiplicity data obtained from fissioning ^{216}Ra compound nucleus (CN) over a wide range of excitation energies and angular momenta. We have considered the population of ^{216}RaCN via three different fusion entrance channels such as ^{12}C+^{204}Pb, ^{19}F+^{197}Au and ^{30}Si+^{186}W. The neutron multiplicities considered in this work have been obtained from the fusion-fission experiments performed using beams from 15UD pelletron accelerator at Inter University Accelerator Centre (IUAC), New Delhi. The experimental neutron multiplicity data for the three aforementioned reactions have been analysed using a statistical model code VECSTAT. This code simulates the decay of a compound nucleus by the Monte Carlo technique. The model incorporating dynamical hindrance in nuclear fission due to dissipation, shell corrections in the fission barrier and level density, and CELD. The evaporation of neutrons, light charged particles, gamma rays, and fission are considered as the decay modes of the CN. The emission of neutrons at higher excitation energies could only be understood in terms of nuclear dissipation. Marginal entrance channel dependene on pre-saddle and post saddle neutron emission also found in this work.

9. Realizing Ultra-Thin Reflection Modulators Through the Phenomena of Asymmetric Reflection of Light

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Metasurfaces are capable of controlling the polarization of electromagnetic waves with interesting effects such as giant optical activity, strong circular dichro-

ism, and asymmetric transmission (reflection) for linearly (circularly) polarized electromagnetic waves. Over the conventional birefringent crystals or the Faraday effect, polarization control devices based on Metamaterials offer advantages such as high efficiency, easy fabrication, and ultra-thin thickness. Hence, here we propose an Asymmetric polarization converter capable of converting an incident RCP wave into LCP with a high polarization conversion of 85% and incident LCP waves to RCP with a very low reflection conversion of 1% at 14.88 GHz. Experimental observations consolidating the simulation results were additionally attained.

10. Surface Plasmon Polariton (SPP) Resonances Using Graphene for Terahertz Applications

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A few monolayers of graphite also known as graphene exhibit excellent tuneable dielectric properties at microwave and terahertz regimes. In this work, we explore the formation of surface plasmon polariton resonances (SPP) in dielectric-graphene sheet-dielectric layers using Kretschmann-Raether and Otto configurations. The SPPs are surface-localized plasmonic electromagnetic modes at the dielectric-graphene interface upon the incidence of transverse magnetic light. A spatial perturbation is introduced in the graphene sheet to study the SPP confinement for various THz applications in the domains of sensing, imaging, and communication devices.

Keywords : Graphene, Tuneable Dielectric Permittivity, Surface Plasmon Polariton Resonances, and THz devices.

11. Microwave Energy Harvesting Metamaterial Absorber at Mobile Phone Communication Waveband (2.44 GHz)

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The abundance of mobile phone frequency signals used for day-to-day communication can be harvested for energizing small electronic elements. However, designing an energy-harvesting element at a microwave frequency is bulky. One can employ the metamaterial (MTM) concept to design an ultrathin planar absorber for energy harvesting applications at mobile phone communication wavebands. In this work, an MTM absorber with 98% absorption efficiency is realized at 2.44 GHz. We demonstrate the possibility of harvesting the electromagnetic energy efficiently using the proposed microwave MTM absorber.

12. Enhanced Dielectric Sensing Using Chiral Metamaterial: A Cross-Polarization Approach

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Metamaterials (MTMs) provide a compelling environment for light-matter interactions, allowing precise control of magnetic and electric dipole phenomena via elaborate metallic patterns. Our focus is on the realization of a bi-layered chiral metamaterial (CMM) for sensing applications. We designed a CMM that exhibits cross-polarization (CP) resonance with over 80% polarization conversion ratio (PCR) across the 5.918 GHz to 6.072 GHz frequency range, specifically for transverse magnetic (TM) incidence. Notably, the maximum PCR of 97.8% occurs at 6.027 GHz. We study the impact of randomly placed dielectric cylindrical objects placed on the top layer of the CMM (as shown in Figure 1(d)). By varying the relative permittivity of th dielectric cylinders from 2.1 to 50, we observe significant changes in PCR. Specifically, Red-Shifted CPR: As relative permittivity increases, the cross-polarization resonance (CPR) shifts. Monitoring this shift enables the estimation of the dielectric permittivity of external particles. Linear PCR Response: The PCR exhibits a nearly linear response to changes in dielectric constant. Leveraging polarization states for monitoring and detecting dielectric objects holds immense promise, particularly in environmental pollution monitoring and molecule sensing. Our ongoing research explores sensing challenges related to random configurations, particle concentration, size, shape, and number. Furthermore, we envision extending this concept to terahertz and optical domains for microplastic sensing and environmental monitoring.

Keywords: Chiral Metamaterial, Cross-Polarization Resonance, Polarization-Conversion Ratio, and Dielectric Sensor.

13. Design and Development of Spectroscopic Instruments for Atmospheric Radiative Forcing Monitoring

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Monitoring climate radiative forcing and understanding the optical properties of atmospheric trace gases and aerosols are fundamental for predicting climate change, formulating effective mitigation strategies, and protecting the environment and human health. Hence, developing spectroscopic instruments tailored for qualitative and quantitative monitoring of atmospheric radiative forcing is of high importance. We present four key instruments: the Broadband Integrating Nephelometer, designed for comprehensive aerosol characterization; the Broad Band Integrating Sphere Integrating Nephelometer, optimized for Mie scattering studies; the Folded Cavity-Enhanced Absorption Spectrometer, specialized for NO_2 detection with high sensitivity; and the Dual cavity-enhanced spectrometer, tailored for Single Scattering Albedo measurements of Microplastics. These instruments offer advanced capabilities, enabling precise and efficient measurements critical for understanding aerosol properties, atmospheric composition, and their impact on climate dynamics.

Keywords: Radiative Forcing, Broadband Integrating Nephelometer, Broad Band Integrating Sphere Integrating Nephelometer, Mie Scattering, Folded Cavity-Enhanced Absorption Spectrometer, Dual Cavity-Enhanced Spectrometer, Single Scattering Albedo.

14. Zero-Bias Differential Photodetectors on Paper Substrate

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Photodetectors are devices that can directly convert light energy into electrical signals. Conventional photodetectors often rely on external power sources, limiting their flexibility and scalability. This work presents a novel approach to self-powered photodetectors fabricated directly on paper substrates utilizing the

pyro-phototronic effect. A heterostructure was fabricated using Niobium Diselenide ($NbSe_2$) as the photo-absorber and silver nanowires. The device generates a differential response upon illumination without any external bias, along with high responsivity. This low-cost, flexible, and sustainable photodetector holds promise for applications in energy harvesting, sensing, imaging, and security systems.

15. A Comparative Analysis of Aerosol Optical Depth between Observations and CMIP6 Models Across Diverse Indian Regions

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Aerosols, tiny solid or liquid particles in the atmosphere, play a pivotal role in altering radiative forcing, subsequently impacting atmospheric temperature and influencing various phenomena of bio-geo-hydro-chemical cycles on Earth. Present study investigates the efficacy of CMIP6 models in reproducing aerosol optical depth (AOD) trend across diverse regions of India, employing data from MODIS Aqua satellite observations. This study aims to quantify the spatial distribution of aerosols and analyse the 20-year trend in AOD across different Indian regions. Utilising 20 years of daily MODIS data, we observe substantial inter-model variations in CMIP6 estimates, highlighting disparities between model simulations and actual observations. The annual mean MODIS AOD is calculated from daily mean AOD (at 0.55 μm), acquired from MODIS Daily 1 Degree datasets. The CMIP6 (Coupled Model Inter-comparison Project- Phase 6) is designed to better understand the past, present and future climate change due to natural and anthropogenic radiative forcing using multi-model simulations. Simulation results from 8 models from the CMIP Phase 6 (CMIP6) are utilised in this study. The CMIP6 "historical" simulations run until 2014 are downloaded. Bias correction is done using CDF function in order to minimise the error and hence to find out the best model which follows the actual trend with a minimum error. The seven areas that make up India are South, West, Central, North, East, North-East, and North-West. To assess the trend, multivariate linear regression was used on the model and observation data. East India

had the highest trend, with a value of 0.01; central India followed with a value of 0.0095; south India showed the lowest trend, with 0.002. Despite the fact that the model trend values diverged significantly from the real trend, following bias correction, the model trend values in practically every region of India were extremely near to the real trend value.

Keywords : AOD, CMIP6 Models, Trend, Inter-Comparison, Bias- Correction.