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Abstract Book



Invited International Speakers

Science Merging into the Unity of Sciences

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Beyond the historical record man has been looking for basic elements of which all matter is made. As the time advanced and history turned its pages a great deal of effort has gone into this inquiry. The science developed and has diversified into various disciplines. The trans-disciplines approach is leading into the unity of science again. Today we are still asking the same question, "what is the origin of matter?" A brief history of the development of science leading to the findings of the early universe during the first few microseconds after the Big Bang will be discussed with the state-of-the art.

Toward Condenser-Based Optical Nanoscopes

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A route for the realization of condenser-based optical nanoscopes (CBON) is discussed in this work. This will impact several biomedical fields where high-resolution optical imaging with large field of view is needed. Condenser-based microscopes with a resolution limit of $\sim\lambda/(NA_o+NA_c)$, where λ is the vacuum wavelength of the light used for imaging, and NA_o and NA_c are the numerical apertures of the objective lens and condenser, respectively, are ubiquitous in biomedical laboratories. However, an image of the sample can only be formed directly in a camera when $NA_c < NA_o$. This limit to $\sim\lambda/(2NA_o)$ the achievable resolution of common condenser-based microscopes. Nevertheless, phase-recovery imaging methods can be used for numerically obtaining synthetic images when $NA_c > NA_o$. Presented experimental results

demonstrates that an illumination direction multiplexing (IDM) Fourier ptychographic microscopy (FPM) algorithm can be successfully applied for processing the images of photonic crystals illuminated by a condenser. In addition, simulation results demonstrating that plasmonics ultrathin condensers (UTC) may have $N_{Ac} \gg 1$ are presented. It is then argued that a CBON with unique capabilities, based on different physical principles than currently available optical nanoscopes, can be realized combining a plasmonic UTC and the IDM-FPM phase-recovery algorithm.

Advancing Science, Engaging Learners:

Moving from Chalk (analog) to Electrons (digital)

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Chemical education has moved from a centric professorial focus to an outcomes-based student-centered approach. The traditional method of lecture and exams, where the professor stands in front of a classroom and lectures with no interaction with students over a specified period of time has been a structured approach utilized for centuries. Over time, this approach changed to the Socratic method where the professor would pose questions to the students and through that process, impart chemical knowledge. As technology became easier to use, systems like computer-assisted-instruction techniques were used to check problems, to impart knowledge, and to simulate analytical instrumentation.

Science, technology, engineering, and mathematics (STEM) education is critically important in today's world of technology and information. However, far too often students are intimidated by mathematics and science and lack confidence in their ability to succeed in learning these fields. This presentation will focus on a few examples of successful methods and techniques to increase the success rates of our STEM students. One example features the pedagogy behind STEM-focused Academic Service-Learning and the program developed and implemented around this

pedagogy. In another example, the use of digital technology to foster learning in a technology-rich learning environment to teach, direct and manage student engagement in science activities will be reported. Such activities are aimed to give students confidence in their ability to tackle STEM learning and to help them better understand scientific phenomena, thereby improving STEM education.

Charged Anisotropic Matter in a Modified Tolman IV Spacetime

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In this research we studied the behavior of relativistic objects with charged anisotropic matter distribution within the framework of MIT-Bag Model considering modified Tolman IV form for the gravitational potential Z which depends on an adjustable parameter n . New exact solutions of the Einstein-Maxwell system are generated. A physical analysis of electromagnetic field indicates that is regular in the origin and well behaved. We show as a variation of the adjustable parameter causes a modification in the charge density, the radial pressure, the tangential pressure and the mass of the stellar object.

An application of Linear Algebra over a cubic field to determine the monogeneity of cyclic sextic fields of prime power conductor

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A problem of Wlady law Narkiewicz involves a classical one to decide whether a number field \mathbf{F} is monogenic or not, going back to R. Dedekind (1870s) and H. Hasse (1960s) [Nar, Problem 6

in page_529]. Let \mathbf{ZF} denotes the ring of integers in a field \mathbf{F} . Then for the field \mathbf{Q} of rational numbers, $\mathbf{Z}_\mathbf{Q}$ coincides with the ring \mathbf{Z} of rational integers.

If the ring \mathbf{ZF} is generated by an integer ξ such that $\mathbf{ZF} = \mathbf{Z}[\xi] = \mathbf{Z}[1, \xi, \dots, \xi^{n-1}]$ with the field extension degree $n = [\mathbf{F} : \mathbf{Q}]$, \mathbf{ZF} is said to have a power integral basis or \mathbf{F} is monogenic. In this talk we consider for the family of abelian sextic fields \mathbf{L} with $[\mathbf{L} : \mathbf{Q}] = 6$ over the field \mathbf{Q} : The fields \mathbf{L} are separated into two cases, and hence the Galois groups $\mathbf{G} = \mathbf{G}(\mathbf{L}=\mathbf{Q})$ of order 6 are cyclic.

i) \mathbf{L} is a composite sextic field $\mathbf{k.K}$ of a quadratic field \mathbf{k} and a simplest cubic field \mathbf{K} with $(d\mathbf{k}, d\mathbf{K}) = 1$, where $d\mathbf{F}$ denotes the field discriminant of a number field \mathbf{F} : ii) \mathbf{L} is a cyclic sextic field of prime power conductor. The case i) is partially solved by Mushtaq Ahmad, Abdul Hameed, Nadia Khan and the author, namely such sextic fields \mathbf{L} are non-monogenic except for finitely many fields \mathbf{L} with a fixed quadratic subfield \mathbf{k} or a fixed simplest cubic field \mathbf{K} [AHKN]. ii) The cyclic sextic fields of prime power conductor p^e are non-monogenic except for 7th, 32th cyclotomic fields and the maximal real subfield $\mathbf{Q}(\zeta_{13} + \zeta_{13}^{-1})$ of 13th cyclotomic field applying Linear Algebra over the cubic subfield with a relative field basis $(1, \eta)$ where the sextic Gauß period is defined by $\sum_{\rho \in \mathbf{GL}} \zeta_p^\rho$ with the Galois group \mathbf{GL} corresponding to the field \mathbf{L} and ζ_n denotes a primitive n -th root of unity, which is a joint work with Nadia Khan and Hiroshi Sekiguchi [KNS].

Open problems. i)6' It remains as an unsolved problem that for the family of the cyclic sextic fields $\mathbf{k.Km}$ with a composite conductor \mathbf{m} are monogenic or not. ii)8' \mathbf{L} is a composite octic field $\mathbf{k.K}$ of a quadratic field \mathbf{k} and a cyclic quartic field \mathbf{K} with a composite conductor such that $(d\mathbf{k}, d\mathbf{K}) = 1$. Then referring [M, GR], determine the monogeneity of the fields \mathbf{L} : ii)8'' Determine the monogeneity of cyclic octic fields of prime conductor.

First-Principles Study of Phase Transformation in AuZn Shape Memory Alloy

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Improvements in first-principles algorithms have permitted electronic structure methods to become important tools for solid state and materials scientists in searching for new materials,

predicting their properties, and understanding the microscopic origins of those properties, which are useful or unusual. As a case study, I use first-principles method for calculating structural parameters and thermodynamical properties of B2 (ordered bcc) and R (rhombohedral) phases of AuZn system. The B2 to R-phase transformation is controversial and has been classified as a second order phase transformation. However, by using first-principles calculations and extend the results to finite temperature, I show that it is indeed a weakly first-order phase transformation.

Characterization of Organogel Prepared from Rice Bran Oil with Cinnamic Acid

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Cinnamic acid (CA) was added to rice bran oil (RBO) at concentrations range from 2 to 12% (w/w) to prepare functional fat-like organogel. The oil binding capacity (OBC) and gel formation time (GFT) of the obtained organogels were determined. The results showed that the OBC was increased and GFT was significantly ($p < 0.05$) decreased with the increase in concentration of CA up to 10% (w/w). Similarly, microscopy analysis showed different gel network structures and crystalline behavior for the organogels prepared with varying concentrations of CA. The rheological and thermal properties of the organogel were improved with the increase in CA concentration up to 10% (w/w). The X-ray diffractometer and Fourier Transform Infrared spectroscopy analyses indicated that the gel network formed based on crystalline of CA and physical entanglements among the organogel components. In addition, the organogel of RBO with 10% CA (w/w) showed a uniform and homogenized structure during storage at 5 °C for 28 days compared to the organogels prepared with 6 and 8%. Therefore, it can be suggested that cinnamic acid is a good organogelator for preparing functional fat-like organogel from rice bran oil.

Antibacterial activity of Gold nanoparticles and their Reduced Graphene Oxide Nanocomposites against drug Resistant Bacteria

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In this study, we used a new and simple method for the preparation of gold nanoparticles (AuNPs) and AuNPs/reduced graphene oxide (RGO) nanocomposites using irradiation from a commercial microwave oven. The size, morphology and crystallinity of the prepared AuNPs and AuNPs/RGO nanocomposites were studied using X-ray Diffraction (XRD), transmission electron microscopy (TEM), scanning electron microscopy (SEM). XRD, Raman, UV and TEM analyses confirmed that the AuNPs were indeed anchored onto the RGO sheets with face centered cubic (FCC) structure. The antibacterial activity of these nanocomposites was tested against the Gram negative bacterium *Escherichia coli* and Gram positive *S. Aureus* with regard to colony inhibition. The results revealed that by bonding AuNPs to sheets of reduced graphene oxide (RGO) bacterial inhibition was achieved which was compared to pure RGO and pure AuNPs. We also tested the nanoparticle and nanocomposites were also tested against drug resistant *Salmonella typhimurium* and *Mycobacterium tuberculosis* strains. We observed significant colony inhibition by nanocomposites as well as nanoparticles. Based on our results we recommend nanogold particles for as an alternative therapy against drug resistant *Salmonella typhimurium* and *Mycobacterium tuberculosis*.

Australia, Innovation and International Cooperation

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Australia's path to innovation began with the very early use of tools and cultivation by aboriginal communities. With the arrival of Europeans from 1788, innovation focused on supporting agricultural production and mineral extraction. More recently, Australian innovation has extended to include high technology products such as the Cochlea Ear and the production of plastic bank notes, developed through a strong foundation in fundamental science. Looking to the future, Australia has greatly expanded its international cooperation. Bibliometric data (to be presented) show strong growth in collaborative chemical research papers between chemists in Australia and those in China, greatly exceeding those with Japan and India, the next strongest partners in collaboration. The most productive areas of chemistry for international collaboration are physical chemistry and chemical engineering.

Effect of enrichment with stabilized rice bran and extrusion process on gelatinization and retrogradation properties of rice starch

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Rice starch (RS) and blend of rice starch with 10% w/w of stabilized rice bran (SRB) were subjected to extrusion process in a co-rotating twin-screw extruder. The effect of SRB addition and extrusion on gelatinization and retrogradation properties of RS was investigated. The results obtained from the rapid visco analyzer (RVA) showed a significant decrease ($p < 0.05$) in viscosity of the extruded RS compared to the untreated RS. In addition, the viscosity was more decreased after enrichment of RS with SRB and extrusion. A similar decrease trend in gelatinization enthalpy (ΔH_{gel}) of RS was also observed from data of the differential scanning calorimetry (DSC). On the other hand, the enrichment with SRB and extrusion led to significant changes in the crystalline structure of RS as observed from the X-ray diffraction (XRD). Furthermore, the enrichment with SRB and extrusion generated a fibrous and porous structured starch gel with lower retrogradation rate, higher water-holding capacity, and less syneresis during storage at 4°C for 7 days. Therefore, SRB can be recommended as functional food

ingredient for enrichment and producing rice starch-based extruded snacks and ready-to-eat food products.

Phase-Recovery Imaging of Photonic Crystals Using Hemispherical Digital Condensers

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We describe experiments where Fourier ptychographic microscopy (FPM) and dual-space microscopy (DSM) are implemented for imaging photonic crystals using a hemispherical digital condenser (HDC). This may be relevant in biomedical imaging applications. Simulations of both phase-recovery imaging techniques show that the resolution limit of both techniques when imaging photonic crystals should be $\sim\lambda/(NA_o+NA_c)$, where λ is the vacuum wavelength of the light used for imaging, and NA_o and NA_c are the numerical apertures of the objective lens and the HDC, respectively. However, after processing the experimental images using both phase-recovery algorithms, we found that FPM cannot image periodic structures with a period (p) smaller than the Rayleigh resolution limit, $\sim\lambda/(2NA_o)$, but DSM can image photonic crystals with $p < \lambda/(2NA_o)$. We studied the origin of this apparent contradiction between simulations and experiments and we concluded that the occurrence of unwanted reflection in the HDC is the source of the apparent incapability of FPM for imaging photonic crystals with $\lambda/(NA_o+NA_c) < p < \lambda/(2NA_o)$. We also elucidated using simulations how is possible that FPM can be used for imaging photonic crystals with a period so small that no experimental image can be observed the periodicity of the sample.

Characterization and Antibacterial Application of ZnO NanoParticles Prepared by Mechano-Chemical Method

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Structural investigations, optical properties and antibacterial performance of the mechano-chemically synthesized Zinc Oxide (ZnO) nanoparticles (NPs) are presented. The morphology, dimensions and crystallinity of the ZnO NPs were controlled by tweaking the mechanical agitation of the mixture and subsequent thermal treatment. Spherical ZnO nanoparticles with small (<20 nm) dimensions and narrow size distribution were successfully obtained after treating the mechano-chemically prepared samples at 250°C. TEM, XRD and UV-Vis spectroscopy results suggested crystalline and phase pure ZnO. The NPs demonstrated promising antibacterial activity against Gram negative foodborne and waterborne bacterial pathogens i.e. Enteropathogenic *E. coli* (EPEC), *Campylobacter jejuni* and *Vibrio cholerae* as well as Gram positive methicillin resistant *Staphylococcus aureus* (MRSA), thus potential for medical applications. Scanning electron microscopy and survival assay indicated that most probably ZnO nanoparticles cause changes in cellular morphology which eventually causes bacterial cell death.

Invited National Speakers

Interlinking of Socio-economic Problems with Environmental Problems for Appropriate Development in Both Developed and the Developing Countries

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“Appropriate Technology” and “Sustainable Development” are two genuine concepts that have been displayed on the international screen for addressing the problems of destabilization of national economies, food and energy shortage, and poverty and unemployment. Appropriate

technology concept seems to have disappeared from the scene while sustainable development is being yet actively pursued and has been accepted internationally as a tool to protect future generations from the shocks of poverty, unemployment, lack of energy and environmental damages. This keynote is designed to integrate the results of studies undertaken on different frontiers by a group of researchers to address the problems highlighted above with special reference to sustainable development and offer appropriate solutions how to make the best use of available resources and assign economic value to different wastes via resource recovery through material sorting, recycling and reprocessing, production of food, heat and electricity and so on. The major focus of discussion will be on techno-economic disposal of different wastes to adapt them as alternative resources instead of treating them as wastes. Thus the article concludes that the techno-economic disposal of wastes can effectively address the problems of energy and food shortage because it is based on the hypothesis, "Total amount of resources in the universe remains constant although they may change from one form to another". This hypothesis provides a firm basis for sustainable development; the concept being contemporarily followed as a cure for socio-economic ills that destabilize the shaky economies. The study supports the view that a waste is no more a waste as every waste can be assigned an economic value. The integrated results of conducted studies in context of sustainable development strongly recommends interlinking of economic problems with environmental problems.

Production of Biodiesel from Non-Edible Seed Oils Using Both Enzymatic and Alkali Catalysis in Batch Reactor

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Biodiesel production from non-edible oil like *Jatropha* is effective way to resolve limited amount of traditional raw materials and their high prices. The main objective of the present study is to optimize the process parameters (methanol/oil molar ratio, reaction temperature, mixing intensity or stirring, catalyst concentration etc.) for both enzymatic and two step alkali catalyzed

trans-esterification of *Jatropha* oil into biodiesel in Batch reactor. Based on the results the optimum operating conditions for alkali catalyzed trans-esterification were 6:1 methanol to oil molar ratio ,1% w/v KOH catalyst concentration ,stirring speed of 600 rpm at temperature 60⁰C ,and a reaction time of 90 min's giving the highest volumetric FAME yield of 98%.whereas from the enzymatic trans-esterification a maximum volumetric yield of 89% was achieved at reaction parameters of oil: methanol ratio of 1:9, agitation speed 150 RPM, cell suspension as lipase catalyst 10% v/v, reaction temperature 37°C and n-hexane concentration 10% v/v ,moreover changing values from optimum leads to yield loss. Biodiesel produced was further analyzed by Thin Liquid Chromatography (TLC) and Fourier Transform Infrared Spectroscopy (FT-IR), comparison of IR spectra was done for both *Jatropha* oil and its biodiesel which shows different peaks and bands stretching variation from their crude oil confirming the conversion of oil into FAME. The study also throw light on the identification of cheap, potential and underutilized *Jatropha* feed stock for biodiesel production in Pakistan and further refinement in production process is necessary to be made also, with reference to Pakistan little study was done on the optimization of biodiesel production from *Jatropha* oil, based on the result of study the current methods will be valuable for the cost effective ,eco-friendly and sustainable production of biodiesel from non-edible *Jatropha* oil.

THE REALM OF COMPOSTING AS IRRESISTIBLE IMPULSE TO DECENTRALIZED MUNICIPAL SOLID WASTE MANAGEMENT IN LAHORE

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On account of poor techno-economic analysis (TEA) of current municipal solid waste management (MSWM) plan in Lahore, there has been pressing problem of economic viability and duration of sustenance of current approach. The payback components of MSWM plan are

negligible as compared to the components of input cost. The demographic and territorial boundary dynamics of Lahore as city proper seem to worsen this scenario in the upcoming time. Integrated MSWM, a workable solution in such scenario, is a multidimensional dynamic approach for improving the TEA of MSWM plan. Composting is a dominant and situation-driven part of integrated MSWM in scenarios where MSW contains dominant fraction (>70 %) of biodegradable organics. However, feasibility of composting as dominant approach to deal with dominant (> 70%) part of waste through decentralized MSWM in Lahore has pros and cons. This study strongly advocates incorporation of composting in the current MSWM plan of Lahore at source level with possibilities of improving TEA of the current plan. Furthermore, light is shed on the workable ideas of making composting an adaptable irresistible approach at different points in the City. Lowering of the transport and labor cost to significant level along with environmental stakeholder scenarios of current MSWM plan are also documented.

Heterogeneous photocatalyst containing ternary metal oxides nanocomposite for degradation of pesticides

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Ternary metal oxides nanocomposite is a material made from three different constituent elements having particle size between 1-100 nm. The different compositions of nanocomposite were prepared with Cerium (Ce), Zinc (Zn), Oxygen (O), Tin (Sn), Silicon (Si) and Titanium (Ti) with different proportions like CeO_2/SiO_2 , SnO_2/TiO_2 , CeO_2/ZnO etc.

We used sonication, sol-gel and hydrothermal methods for the synthesis. Effect of pH, temperature, feed rate, surfactants etc. on the particle size, surface area and photocatalytic activity of nanocomposites were studied.

The nanocomposites were characterized by Scanning Electron Microscopy (SEM), Powder X-Ray Diffraction (XRD), Transmission Electron Microscopy (TEM), Energy Dispersive X-Ray (EDX), Thermogravimetric Analysis (TGA) and Fourier Transform Infrared Spectroscopy (FTIR). Optical properties of the nanocomposites were determined using Solid Phase Spectrophotometer (SPS). Photocatalytic degradation of pesticides was carried out to determine

the catalytic properties of the nanocomposites. XRD and TGA data were also used to calculate the thermodynamics parameters and results were compared. It was found that nanocomposites prepared with Critical Micelle Concentration (CMC) of surfactants showed small particle size influencing red shift, and highest photocatalytic efficiency as compared to the samples prepared with other concentrations. All nanocomposites showed more than 90% activity towards photo degradation of pesticides under sun light.

Catechol electrochemical sensor based on SiO₂/C/CuO-nanostructure modified with Ionic liquid

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Silica-graphite (SiO₂/C) was synthesized by sol-gel method. Copper oxide (CuO) was immobilized *in situ* on (SiO₂/C) matrix. SiO₂/C/CuO was modified with benzimidazolium-1-acetate Ionic Liquid by ultra-sonication. Surface area $S_{BET} = 99.87 \text{ m}^2/\text{g}$ and pore volume (0.30 cm³/g) were characterized by BET multipoint technique. Scanning electron microscopy (SEM) images showed material compactness having no phase segregation with in the magnification used and EDS mapping showed the homogeneity of material. Pressed disk electrode made with nanocomposite material SiO₂/C/CuO/IL was tested as electrochemical sensor for determination of catechol. Electrochemical Impedance spectroscopy showed that the electrode modified with ionic liquid has lowest charge transfer resistance and it assists the charge transfer because of its ionic nature. SiO₂/C/CuO/IL electrode exhibited excellent sensitivity, linear response range and low limit of detection (LOD) which are 678 nA dm³ mmol⁻¹cm⁻², 0.2-10 mmol L⁻¹ and 6.76 μmol dm⁻³ respectively. Sensor also showed very good sensitivity for the determination of catechol in environmental samples i.e. water from Monnoo Yarn Dyeing industry.

Existence of Fixed point of Edelstein-Suzuki type multivalued strict contractions on b-metric spaces and best approximation theory

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The aim of this talk is to present an introduction of Edelstein-Suzuki type generalized multivalued strict contractions and then a proof of fixed point theorems in compact b-metric spaces. We also discuss coincidence and common fixed point results for the hybrid pair of mappings in compact b-metric spaces as applications of main result. A result in best approximation theory for generalized non expansive mappings satisfying a certain condition is also obtained.

Comparative Study of Alternative Power Policies

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After hydel power plants the coal, gas and oil fired power plants have remained the conventional power plants until first half of twentieth century. Power producers welcomed the innovatory nuclear energy in second half of twentieth century. Nuclear reactors construction rate peaked in 1970s followed by a steep decline in 1980s due to Three Mile Island and Chernobyl reactors accidents. Nuclear power adoption trend kept on rising until Fukushima Daiichi incidence in 2011 which relayed far reaching domino effects on nuclear power policies worldwide. Japan shut down all 55 nuclear power plants within one year bearing the blunt of 49,580MW power loss. Germany shut down 7 out of 18 reactors and pledged to phase out the rest gradually by 2020. Fukushima nightmare spread the myth that if it can happen thrice on lands of most skilled countries then it can happen by human error, natural cause or any new basis again and again anywhere anytime. This work compares economic, environmental and mortality rates of nuclear,

fossil fuels and renewable energy options to conclude that nuclear power its scary outlook is more economic, eco-friendly and harmless compared to conventional fossil fuels, especially, open fired coal power options.

Supramolecular Drug Delivery System

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It has been discovered that the non-planarity of *p*-octiphenyl rods (acting as staves) and the antiparallel arrangement of β -sheet peptides attached to octiphenyl rods, result in a cylindrical self assembly process which subsequently forms a supramolecular artificial barrel¹. These barrels have shown some exciting properties like catalysis, molecular recognition². If mettaloporphyrins, cyclodextrin, calix[4]arene, polyaromatic macrocycle would be attached to octiphenyl rods as “hoops” instead of peptides, the co-facial aggregations, hydrogen bonding and π - π stacking should lead to an analogue self assembly process. Ultimately a barrel should be obtained having cavities between some porphyrins “hoops” for molecular recognitions of intercalating guests by π - π interactions and co-ordinations. The range of molecular recognition is expected to be vast, covering amino acids, nucleotides, fullerenes, aromatic compounds etc. It would also have practical applications in drug delivery systems etc. Synthesis of porphyrin as a hoof has been accomplished and its various properties are under investigation.

A Simple Technique to Fabricate Carbon Nanotube Gas Sensing Platform

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In this study, high voltage arc discharge technique is used for direct fabrication of carbon nanotube gas sensing platforms. The CNT samples are grown between graphite electrodes mounted on PCB templates in 2-5 mm gap using pure methane and liquid petroleum gas at different flow rate 0.2-1 SLPM under atmospheric conditions. This report discusses the synthesis detail of nano-carbon strands and effect of gas flow on current–voltage characteristics at different flow rates. The structure of the grown carbon strands is explored in macro regime by high resolution optical microscope and also by SEM technique. These nanocarbonstrands might have promising application for sensor applications and also for fabrication of nanoelectronicsCNTFETdevices.

Stimulation of β -adrenergic receptors plays a protective role via increased expression of RAF-1 and PDX-1 in hyperglycemic rat pancreatic islet (RIN-m5F) cells

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It is a widely-held view that a progressive reduction of beta-cell mass occurs in the progression of diabetes. RAF-1 kinase and pancreas duodenal homeobox 1 (PDX-1) are major factors that promote survival of cells and maintain normal insulin functions. In this study, we investigated the effect of a β -adrenergic receptor agonist and antagonist on RAF-1 and PDX-1, and their respective effects on apoptosis and insulin release in RIN-m5F cells. RIN-m5F cells were

cultured in normal (5 mM) and high (25 mM) glucose to mimic diabetic conditions, followed by treatment with 5 μ M, 10 μ M and 20 μ M of isoproterenol and isoproterenol + propranolol for 6, 12 and 24 h. Western blotting and reverse transcription analysis were performed to examine the expression of RAF-1 and PDX-1. Annexin-V-FITC and terminal deoxynucleotidyltransferase-UTP nick-end labeling (TUNEL) assays were used to investigate apoptosis. ELISA was used to measure insulin levels. Reverse transcription polymerase chain reaction was conducted to investigate the expression of genes. Stimulation of β -adrenergic receptors with isoproterenol significantly induced RAF-1 and PDX-1 genes in a concentration-dependent and time-independent manner. Changes were significant both at protein and mRNA levels. Up-regulation of RAF-1 and PDX-1 was accompanied by improved insulin levels and reduced apoptosis. Concentrations of 10 μ M and 20 μ M for 12 and 24 h were more effective in achieving significant differences in the experimental and control groups. Propranolol reversed the effect of isoproterenol mostly at maximum concentrations and time periods. A positive effect of a β -adrenergic agonist on RAF-1 and PDX-1, reduction in β -cell apoptosis and improved insulin contents can help to understand the pathogenesis of diabetes and to develop novel approaches for the β -cell dysfunction in diabetes.

Global Chemists' Code of Ethics

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Introduction-Making Positive Change Happen

Chemical practitioners¹ should promote a positive perception and public understanding and appreciation of chemistry. This is done through research, innovation, teamwork, collaboration, community outreach, and high ethical standards. Chemistry professionals² should act as role models, mentors, and advocates of the safe and secure application of chemistry to benefit humankind and preserve the environment for future generations. They should instill and encourage curiosity and innovation early and often, and recognize and award achievements where appropriate. Finally, chemistry professionals should provide professional

inputs and opinions to government and other decision makers regarding industrial, environmental, and other issues.

Environment

Environmental sustainability should be an integral part of research and education. Chemistry professionals must use their expertise to ensure the safety and health of coworkers and the community, and to protect the environment for future generations.

Chemical practitioners should work within their organizations to help develop sound environmental plans and policies. Chemistry professionals should encourage inclusion of environmental sustainability as a key element in chemistry instruction and engagement with the community.

Chemical practitioners are responsible to ensure the proper use and disposal of chemicals and instruments. They should endeavor to increase their knowledge of the short and long term effects of chemicals on the environment and to apply informed quality control principles.

Research

Research in chemical sciences should benefit humankind and improve quality of life, while protecting the environment and preserving it for future generations. Researchers should conduct their work with the highest integrity and transparency, avoid conflicts of interest, and practice collegiality in the best way. Research should promote the exchange of new scientific and technological information and knowledge relating to the application of chemistry for the benefit of humankind and the environment.

Scientific Writing and Publishing

Scientific publication is a way to share new knowledge. Chemistry professionals should promote and disseminate scientific knowledge in research and innovation throughout outreach, scientific writing and publication for sustainable development. Chemistry professionals should maintain honesty and integrity in all stages of the publication process, which must meet the highest possible standards of data reproducibility and correctness without plagiarism. Chemistry professionals who supervise others have a responsibility to ensure that their scientific writings are free of defects and errors.

Chemistry professionals should promote peaceful, beneficial applications and uses of science and technology through a variety of media. Chemistry professionals have a responsibility to assess information intended for release prior to dissemination.

Safety

A culture of safety is very important and should be sustained by management, including academic, industrial and government leadership. Management should work with chemical practitioners in all aspects of safety including training, regular audits and the development of safety culture. There should always be awareness of safety regulations protecting health and the environment.

All chemical practitioners should exercise safety procedures. Engineering and administrative controls for safety should be in place. Proper personal protective equipment and garments should be used when working with chemicals or in an area with hazards.

Security

A culture of security is important to protect dual use chemicals and facilities. All stakeholders in the chemical supply chain should ensure and practice chemical security. Chemical practitioners should ensure that laboratories and industrial facilities have the capacity to secure chemicals. Security measures need to be reviewed regularly. Management should have oversight of security and should follow all local and international laws and regulations.

Materials with mind: Memory Training and Transformation behavior

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Shape memory alloys are blessed materials which can memorize their shape and can recall as and when we require. The functional fatigue behavior (Transformation) of Ti₅₀Ni₃₀Cu₂₀ (at.%) shape memory alloy was investigated after subjecting to cold working and heat-treatment. Copper addition modified the phase transformation behavior with the introduction of B19-phase

in the binary NiTi alloy. It was observed that aging after annealing and thermal cycling (-60 to 100)°C significantly effect the transformation temperatures. Observations in optical microscope and scanning electron microscope reveal inhomogeneity in the composition in the form of coarse Cu+Ti-rich precipitates. Investigations under transmission electron microscope showed growth of internally twined martensitic plates in solution treated sample. The phase transformation temperatures were determined with differential scanning calorimeter. The transformation temperatures were shifted towards lower side. Dislocations introduced during cold working and fine precipitation after aging, may be responsible for this change in the transformation characteristics of the material.

Occipital Bone Fracture Reconstruction using B-spline Curves

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Treating trauma to the cranio-maxillofacial region is a great challenge and requires expert clinical skills and sophisticated radiological imaging. The aim of reconstruction of the facial fractures is to rehabilitate the patient both functionally and aesthetically. In this article we employed B-spline curves to construct the occipital bone fracture using Digital Imaging and Communications in Medicine (DICOM) format data. The construction of occipital bone fracture starts with the boundary extraction followed by corner detection, construction of fractured part inner outer curve for each DICOM data using B-spline curves and finally the construction of fractured part in DICOM format. Method used in this article is based on DICOM data only and does not require any technique such as mirror imaging, technical help, reference skull, or to take average thickness of skull bone. Using the proposed method, the constructed fractured implant is custom made for every individual patient. At the end of this article we present a real case, in which we have constructed the occipital bone fracture using B-spline. The

proposed method has been validated using post-operation DICOM data. For practical application, Graphical User Interface (GUI) has been developed.

On rotational flows of rate type fluids with shear stress on the boundary

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In this talk, we will discuss rotational flows of some rate type fluids with/without non integer order derivative models. The fluid fills an infinite straight circular cylinder and its motion is generated by a time dependent torsion, applied to the surface of the cylinder. As novelty, the dimensionless governing equation related to the non-trivial shear tension is used and exact solutions analogous to a ramped as well as sinusoidal shear stress on the surface are obtained using integral transforms. The results that have been obtained allow us to provide solutions for ordinary\fractional Oldroyd-B, Maxwell and ordinary Maxwell fluids performing similar motions. Moreover, the control of non-integer order framework on shear stress and velocity profiles is analyzed by numerical simulations and graphical interpretations.

Cosmological reconstruction and energy bounds in extended scalar tensor theory

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The cosmological reconstruction of $f(R, R^{\alpha}\ddot{R}^{\beta}, f)$ theory of gravity corresponding to a power law and de Sitter evolution in the framework of the FRW universe model will be discussed. The energy conditions for this modified theory will also be discussed which seems to be more general and can be reduced to some well-known forms of these conditions in general relativity, $f(R)$ and $f(R, f)$ theories. The analysis of energy conditions using reconstructed models will also be discussed.

A Computational Investigation on the Dynamics of Shallow Water Waves

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The dynamics of shallow water waves has been an active research area for the past several decades [1-6]. In this context, there are several models that govern this wave flow. In this study, finite element method based on B-spline interpolation functions are successfully applied to Korteweg-de Vries equation with power law nonlinearity to examine the motion of a single solitary wave whose analytical solution is known. The stability analysis is also carried out for these waves. Also, evolution of solitons is studied with Gaussian and undular bore initial conditions.

Functional Characteristics of oleogel prepared from sunflower oil, Beta-Sitosterol and Stearic acid

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β-Sitosterol (Sit) and Stearic acid (SA) were combined at varying ratios (w/w) and added to sunflower oil (SFO) at the concentration of 20 g/100 g oil for preparing edible fat-like oleogel. The oleogel was characterized using optical microscope, FTIR, XRD, DSC, and texture analyzer. The oil binding capacity, melting temperature, and firmness of the oleogel increased with the increase in the amount of SA in the gelators combination (Sit:SA, w/w). The microscopic analysis show that the gel network formed based on crystallization and self-organization of gelator molecules and both gelators show independent crystalline behavior. In addition, the FTIR spectra showed that the gel network formed via physical entanglements and stabilized by hydrogen bonding. XRD diffraction patterns indicated high lateral packing of molecular layers. On the other hand, for studying the effect of varying concentrations of gelators combination,

Sit3:SA2 (w/w) combination was added to SFO at concentration of 10, 15, 20, 25, and 30 g/100 g oil. Oil binding capacity and firmness of the oleogel improved as the concentration of gelators combination (Sit3:SA2) increased from 10 to 30 g/100 g oil. It can be concluded that saturated fat alternative oleogel can be prepared from SFO with specific Sit and SA combination.

Effect of microwave irradiation on internal molecular structure and physical properties of waxy maize starch

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Native waxy maize starch was treated at a moisture content of 30% by microwave irradiation for 5, 10 and 20 min, respectively. The molecular structure and physical properties of waxy maize starch were characterized. Compared with native maize starch, lower population of short chains of amylopectin (A chain), higher proportion of short B1, B2 and B3 were observed in irradiated starches. ¹H NMR data show that a -(1,6) glycosidic linkages were destroyed more easily than a -(1,4) glycosidic linkages during microwave treatment. An increase in gelatinization temperatures and a decrease in the molecular weight, the relative crystallinity, DH, viscosities and syneresis were observed. Gelatinization temperatures were positively correlated with long chains B3 with DP > 36, while DH and syneresis were negatively correlated with them. The extent of the changes induced by microwave treatment for different times revealed that the major degradation occurred in internal chain (amorphous region) at the first stage (microwave, 5 min), the external chain (crystalline region) mostly destroyed at the second stage (microwave treatment for above 10 min). The foregoing data indicated that the molecular structure of amylopectin is a critical factor determining physical properties. Keywords: Waxy maize starch Chain length distribution Microwave Property

**Preparation and characterization of modified and functional starch (hexadecyl
carboxymethyl starch) ether using reactive extrusion**

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Water-soluble carboxymethyl starch (CMS) derivatives with both hydrophobic and hydrophilic characteristics were synthesized by reacting CMS with cetyl bromide (CB) using an extrusion process in an alkaline etherification reaction. A series of hexadecyl carboxymethyl starch ethers (HCSE-ex) with degrees of substitution ranging from 0.0257 to 0.0701 were characterized under different reaction conditions based on their physical (morphology and viscosity) and thermal properties. FTIR, SEM, TGA, and X-ray results confirmed that etherification produced high reaction efficiencies, and the derivatives exhibited excellent emulsification efficiency. The application of extrusion as an energy source resulted in a much reduced etherification time compared with traditional methods, down from several hours to several seconds, indicating the high potential of extrusion to improve and increase the efficiency of technological polysaccharide etherification.

**EVALUATION OF GREENHOUSE RESIDUES GASIFICATION PERFORMANCE IN
HYDROGEN PRODUCTION**

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In this study, a modeling study was carried out to investigate the potential of hydrogen production from greenhouse tomato and pepper residues blending in different rates (0%, 25%, 50%, 75% and 100%) by air-steam gasification. The numerical model developed for the gasification system assumes that all carbon in the mixture is gasified. Air to fuel rate and steam to fuel rates are 0.05 due to high content of O₂ in biomass residues. The gasifier temperature is 877 °C (1150 K) for developed model. According to the result of this study, increasing tomato

residues blending rate increases hydrogen content of syngas. It is mainly caused by the content of O₂ in tomato residues being higher than content of O₂ in pepper residues. This study shows that the O₂ content of greenhouse residues is an important factor in syngas production, especially in H₂ production.

Optical properties of thin films of niobium oxide prepared by electron beam evaporation

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Niobium oxide films with different thickness were prepared using the electron beam evaporation method. Major deposition parameters, including oxygen partial pressure and substrate temperature maintained during film deposition, affecting the optical properties of films is studied. X-ray diffraction result shows that all the deposited films were amorphous. A method requiring measurements at normal incidence of transmission from two films of different thickness prepared under identical conditions was used to determine the optical constants. Substantial changes in the optical constants were observed following changes in the preparation conditions. Perhaps one of the main causes could be the degree of deficiency of oxygen (i.e. excess metal) in the films. Indices of refraction and absorption increase as the degree of oxygen deficiency in the film increases. On the other hand, bandgap energy decreased as the degree of oxygen deficiency increased.

Structural, Dielectric and Magnetic Properties of Chromium Doped Iron Oxide Nanoparticles

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Functional iron oxide nanostructures are of particular interest during the last decade for their remarkable properties which makes them suitable for broad range of applications. Un-doped and

chromium doped iron oxide nanoparticles (NPs) have been synthesized using sol-gel method. Dopant concentration is varied as 1-9%. XRD results confirm the formation of hematite phase in un-doped and Cr-doped NPs. Shift in peak position, to higher angles, might have observed because of the lower ionic radius of Cr (61.4pm) as compared to iron (74pm). Dielectric constant remains constant at low frequencies and increases as frequency of applied field was increased to 10MHz. Such type of variation in dielectric constant is associated with space charge polarization. Increase in dielectric constant till dopant concentration of 7% arises due to reduction in grain size to 35nm. It can be seen through cole-cole plots that because of high resistance of grain boundaries, resistance of grain and grain boundaries cannot be separated. VSM results show increase in saturation magnetization as dopant concentration is increased to 7%.

Assimilation of Magnetoelectric Profiles of Compound and Composite $(\text{NiO})_x(\text{Fe}_2\text{O}_3)_{1-x}$

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Ferrites are extensively used as one of electronic materials because of their superior electrical and magnetic properties and low cost production. A comparison of magnetoelectric response of $(\text{NiO})_x(\text{Fe}_2\text{O}_3)_{1-x}$ ($x = 0.25, 0.5$) compound and composite is presented in this study. For $(\text{NiO})_x(\text{Fe}_2\text{O}_3)_{1-x}$ composite, NiO and Fe₂O₃ were prepared using a simplified sol-gel method. Both materials were mixed in desired composition by weight. For compound $(\text{NiO})_x(\text{Fe}_2\text{O}_3)_{1-x}$, same method was utilized for synthesis. Pellets made by both samples were sintered at 550 °C. The phase and composition of prepared samples were confirmed using X-ray diffractometer (XRD). AC electrical properties were measured as a function of frequency. Frequency range was from 1 kHz-3 MHz. The results can be explained on the basis of Curie-Weiss law.

Transport Studies in Chemically Synthesized Nanostructured Ferrites for Advanced Applications

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Spinel ferrites with adaptable electrical and thermal properties have been obtained by doping a small amount of RE elements. Spinel ferrites are generally produced by ceramic routes in industry. Minimizing the production costs by simplifying traditional process is also looked-for. As the economic magnetic materials, ferrites are also being developed with advanced synthesis methods for new applications. Several ways are applied to enhance the microstructure and properties. Recent work on simplistic preparations and potential applications for nanostructured ferrites will be discussed. To obtain nanoferrite powders, numerous methods could be utilized like simplified sol-gel method namely the WOWS (Without Water and Surfactants) sol-gel method, co-precipitation method etc. These materials have been found useful in a wide field, from resistive switching (resistive random access memories (RRAMs)), to medical, energy and environmental applications.

Comparative study of Structural and Electrical Properties of Cobaltite Nanoparticles

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Perovskites oxides having general formula ABO_{3-d} have many applications in different research areas. Perovskites based oxides materials has capability to manage a wide range of oxygen stoichiometry, variable oxidation state of B site transition metal atom and mixed electronic-ionic conductivity. Strontium cobaltite ($SrCoO_{3-d}$) and Barium strontium cobaltite ($Ba_{0.5}Sr_{0.5}CoO_{3-d}$) are important members of perovskite family. Strontium cobaltite (SC) and Barium strontium

cobaltite (BSC) nano particles were synthesized by composite mediated hydrothermal method (CMHM). X-ray diffraction (XRD) was done to study the structural properties such as crystal structure, crystallite size and phase purity. AC electrical properties like ac conductivity, dielectric constant, dielectric loss tangent and impedance were studied as a function of frequency at room temperature of samples sintered at 850OC. The selected frequency range was from 20 Hz to 3 MHz. The dielectric loss tangent and dielectric constant decreases while ac conductivity increases with the increase in frequency. The AC Electrical properties of both materials synthesized by CMHM method were compared and correlated to structural properties. The synthesized samples can be used as an electrode material in intermediate temperature range solid oxide fuel cells (IT-SOFCs).

SESAME (Synchrotron-light for Experimental Science & Applications in the Middle East) -A new hope for scientific community in Pakistan

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SESAME (Synchrotron-light for Experimental Science & Applications in the Middle East) is an international research center in Jordan jointly pursued by the European Union and numerous developing countries (including Pakistan). It will facilitate world-class research by scientists (in subjects ranging from biology & medical sciences through materials & environmental science & physics, to archaeology). With the development of SESAME there is a need to setup a network consisting of scientists, engineers and academicians; and to expand it in order to have an active users community of synchrotron radiation in Pakistan. Being motivated by a relatively easy availability of such an expensive and high-valued facility for the scientific community in Pakistan, the present paper not only introduces the basic ideas regarding the synchrotron light but also gives a brief overview of the collaborative research (in the context) and some future projects/ thoughts for building up a more lively users community of synchrotron radiation.

Review of laser induced plasma plume dynamics by Anisimov model

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Since the laser intensity exceeds the ablation threshold, interaction of solid with the laser pulse leads to the melting, evaporation, ionization of the material and the formation of cloud of ablated species thus leading to formation of isothermally expanding plasma that persists until after the termination of laser pulse. Different regimes in plasma plume begin immediately after the laser pulse termination in which plume dynamics is investigated under vacuum, where velocity of the ablated species remains constant. Plume dynamics is a complex phenomenon, thus an appropriate theoretical description is required for the plume expansion for a wide range of ablation conditions, so several mathematical models have been proposed for different pressure. The theoretical description considered by Anisimov is based on adiabatic expansion of the plume and this theory begins after the termination of the laser pulse, expansion dynamics of plasma plume produced by laser is investigated in which the analysis is based on the special solution of gas dynamics equations that describes the expansion of an ellipsoidal gas cloud into vacuum. In this model a three dimensional core dense plume is studied.

Prevalence of untypable HCV variants in different districts of Punjab, Pakistan and a case report of its treatment strategy

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In Pakistan, HCV infection is increasing day by day and around 11 million people are infected mainly with 6 circulating genotypes and subtypes and the viral burden is still escalating. Knowledge about HCV genotype is necessary prior to recommending the suitable antiviral

therapy. Genotype 3a is most prevailing genotype in country and is followed by untypable genotype i.e undetected by the HCV genotyping diagnostic method of Ohno et al. used in present study. Our aim of this study, from 2011-2016, is to analyze the distribution of HCV genotypes in different regions of Punjab province and centered on prominently increasing one (diagnostically untypable genotype) and its possible effective antiviral therapy. It is evident from study that of the total 8353 patients, the genotype 3-subtype 3a (n= 6650 i.e. 79.6%) was most widely spread among the patients followed by undetectable genotype i.e untypable (n= 1377 i.e. 16%). The presence of such a massively increasing untypable variants suggested that there are some quasi species evaluating among HCV patients in local community. We have also characterized an untypable genotype through sequencing and phylogenetic analysis that showed the maximum homology of untypable HCV genotype with 3a genotype from Pakistan. A case study has also verified that untypable HCV genotype had been treated effectively with interferon alpha plus ribavirin therapy for 24 weeks at standard doses and attained the SVR rate of 70-80 %.

Incidence and susceptibility pattern of klebsiella specie from different clinical samples in a tertiary care hospital in Islamabad, Pakistan

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Klebsiella spp. is cause of a number of infections in Pakistan and a major reason behind its high incident rate is its multi drug resistant (MDR) behavior. Antibiotic consumption in Pakistan is highest in the south East Asian per 1000 people which makes Pakistan vulnerable for developing MDR. Unfortunately no study is reported on MDR from Islamabad in last five years, so this study is a humble effort to highlight the gravity of the situation. In this study 800 samples were collected from PIMS hospital Islamabad from different sites of infections i.e blood, upper respiratory track (URT), wound and urinary track infections (UTI). After standard testing, over all 244 (30.5%) infections were due to klebsiella. Among various samples from different sites of infections Klebsiella spp were most common in respiratory track infections with 40% positive results where as semen sample showed least incident 0% Klebsiella spp positive results. Further

more, susceptibility and resistance against each antibiotic was analyzed to find link between site of infection and effectiveness of the drug used. Imipenam and Amikacin had highest susceptibility with sensitivity of 74.5% and 71.2% .On the other hand Cefixime was most resistant with 91.3% resistance. In some cases, like Levofloxacin and Imipenam we got intermediate results as well. We also concluded from our results that susceptibility and resistance of an antibiotic changes with the site of infection. Against wound infection (WI) Ceftriaxone has 53.6% sensitivity which progressively decreased against upper respiratory track infection (URTI) to 21.4%, urinary track infection (UTI) 14.3% and 10.7% against blood infection (BI).

Association of IL-10 promoter polymorphisms with HCV susceptibility and sustain virological responses

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Pakistan is a low socio economic country having more than 10 million people infected with hepatitis C Virus (HCV) with a major genotype of 3a (GT 3a). Due to high rate of resistance to standard interferon plus ribavirin therapy, it is highly needed to identify new marker for response prediction to therapy. Interleukin 10 (IL-10) is a key member of cytokine, which regulates Th1/Th2 cytokine balance, a major part of immune system against infection. As IL-10 production varies inter-individually based on some functional polymorphism in its promoter region. We studied the impact of functionally important polymorphism (-1082 G/A, -819 C/T and -592 C/A) on HCV infection susceptibility and on outcomes of standard interferon plus ribavirin therapy. 90 healthy subjects and 140 HCV patients (95 were responder and 45 were non-responder to therapy) were included in this study. Amplification refractory mutation system-polymerase chain reaction (ARMS-PCR) method was used for IL-10 polymorphism genotyping. High IL-10 producing -1082 GG genotype ($p= 0.02$; OR= 0.4; 95% CI= 0.2-0.8) and GTA haplotype ($p=0.03$; OR= 0.55; 95% CI= 0.3-1) were significantly higher in HCV patients as compared to healthy subjects. IL-10 -1082 GA genotype ($p=0.03$; OR= 1.95; 95% CI= 1.1-3.4) showed protective effect against HCV infection while other allelic, genotypic and haplotypic variants were nonsignificant among HCV patients compared with healthy controls. The current

data failed to show any significant co relation between IL-10 polymorphism inheritance and therapy response in HCV patients.

mRNA expression and not polymorphisms of SOCS3 gene is indicator for non-response and relapse to therapy in Pakistani HCV infected population

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Suppressor of Cytokine Signaling 3 (SOCS3) gene belongs to SOCS family as one of the negative regulators of cytokine signaling and IFN response that function via the JAK-STAT pathway in antiviral response. SOCS3 expression and genetic polymorphism influences the pathogenesis and outcome of antiviral treatment in hepatitis C virus (HCV) infected patients. This study was designed for analysis of SOCS3 gene expression and polymorphism in Pakistani HCV patients. Method: This descriptive study was conducted on 57 diagnosed HCV genotype 3a infected subjects. The study population was divided into two major groups on the basis of therapeutic response i.e. early virological response (EVR) and relapsers. SOCS3 gene mRNA expression analysis was done by using Real time PCR technique, whereas ARMS PCR technique was used for analysis of SOCS3 gene polymorphisms i.e. 8464 A/C (rs12952093), -4874 A/G (rs4969170) and -1383 A/G, (rs4969168). Results: Gene expression analysis of SOCS3 showed that there was statistically significant increase of $1.92 \hat{\pm} 1.28$, and $3.72 \hat{\pm} 1.08$ folds in relative gene expression for EVR and relapsers as compared to normal healthy samples ($p < 0.001$). The distribution of rs4969168, rs4969170 and rs12952093 genotype frequencies between EVR vs relapsers group were not statistically significant, only the allelic frequency of rs4969168 was statistically significant ($p = 0.013$) with therapeutic response. Conclusion: The gene expression analysis of SOCS3 showed a clear difference in mRNA expression of SOCS3 as an indicator of therapeutic response rather than polymorphism of SOCS3 gene in our studied population.

Determination of TGF- β 1 polymorphism at -509 C/T promoter region in HCV patients with and without HCC

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Worldwide hepatitis C virus (HCV) is a significant health problem. This virus has infected more than 170 million people worldwide and is the major cause of acute and chronic hepatitis. HCV-associated liver diseases range from chronic hepatitis to fibrosis, cirrhosis and hepatocellular carcinoma (HCC). HCV is one of the major causes of HCC. Polymorphisms of cytokines genes affect host response to viruses. Transforming growth factor β 1 (TGF β 1) is a suppressor of tumor initiation by inhibiting cellular proliferation or by promoting cellular differentiation or apoptosis in the early phase of cancer development. Variations in the DNA sequence in the TGF- β 1 gene may lead to altered TGF- β 1 production or activity and therefore it can modulate an individual's susceptibility to liver cancer. This study was aimed to determine the polymorphism in the promoter region of TGF- β 1 gene that leads to development of HCC in HCV patients. Method: It was a comparative study, comprising of 80 individuals who were divided into two groups of 40 subjects in each. Group 1 composed of chronic HCV patients while group II had HCV patients with HCC. TGF- β 1 polymorphism was determined by RFLP following conventional PCR. Data was analyzed using SPSS 20.0. Chi-square test was applied to observe association between TGF- β 1 polymorphism allele and study groups. Results: On comparing results between two groups, CT genotype was detected with the frequency and percentage of 16(53.3%) and 14(46.7%) respectively with [OR (95%CI) =1.422 (0.457- 4.427), $p= 0.544$], while TT genotype had frequency and percentage of 11 (39.3%) and 17(60.7%) with OR 2.511 [95% CI = 0.786-8.029, $p=0.120$]. These results showed no significant association between these polymorphisms in HCV and HCC patients but the patients possessing TT genotype or at least having T allele might be at risk of developing HCC due to high OR compared with CC genotype. Conclusion: There was no statistically significant association in the frequencies of allele (TT, CT, CC) TGF- β 1 at -509 C/T promoter region in HCV and HCV patients with HCC. While patients carrying the TT genotype or carrying T allele had high OR

than carrying the C allele. Therefore, TGF- β 1 -509 gene polymorphism might be associated with the risk of HCC in patients with chronic HCV infection in the local population.

Optimization of parameters for hyper-production of alginate by ENU mutated strain of *Azotobacter vinelandii*

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Polyhydroxybutyrate (PHB), a biopolymer, has attracted the attention in the recent years due to its ability to replace the polyethylene, a non-biodegradable plastic. The aim of the present study was to evaluate the potential of different agricultural wastes like wheat bran, rice polishings and molasses for the synthesis of polyhydroxybutyrate (PHB) by *Azotobacter vinelandii*. The optimization of different carbon sources and various physical parameters was also performed. Highest yield of PHB was obtained by fermentation of 4% (w/v) wheat bran after 48 hours of incubation with 4% (v/v) inoculum volume at pH 7.0 and 37°C. Among different nitrogen sources tested, 0.2% peptone gave the better yield (285 mg/100 mL) while yeast extract decreased the amount of PHB. The outcomes of the present data indicate that agricultural wastes can be used for the production of polyhydroxybutyrate that will help in the solid waste management.

Metal substitution in Glucocorticoid Receptor exploits the variation in DNA interactions: A quantum mechanistic probe

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Glucocorticoid receptor (GR), a zinc-dependent metalloprotein, is an intracellular agent responsible for mediating the physiological and pharmacological actions of glucocorticoids. The metal binding motif of GR is a cysteine-rich region. Exposure of GR to metal chelating EDTA results in non-specific binding of DNA. The present study elucidates the zinc substitution with cadmium, cobalt, copper and nickel in GR and its effect on DNA interactions with a quantum mechanistic point of view. Density functional theory (DFT) based geometry optimization, molecular orbital energies and single point energies are calculated using ORCA (ver. 3.0.1) for all metal substituted complexes. Structural comparison of each metal substituted complex is performed using RMSD scores. Furthermore, DNA binding is performed with metal substituted complexes using HEX (ver. 8.0.0) and binding energies are calculated. Results illustrate that zinc and cadmium have highest binding affinity with GR and both these metal are favorable for proper physiological function of GR. DNA binding energy was also highest for these metals. Reactivity of zinc and cadmium was highest among all the metals within the protein due to lowest band energy gaps. In contrast, nickel, copper and cobalt have weak bindings with GR and these metals are not suitable for DNA binding. These findings demonstrate that zinc and cadmium coordination to GR can facilitate the physiological and pharmacological role of GR in humans.

Computational simulation of metal substitution in Desulforedoxin protein and its association with sulfate reduction mechanism in inflammatory bowel diseases

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Desulfovibrio is heterogeneous, sulfate reducing bacteria having more than 30 species. Among those, Desulfovibrio gigas is known to cause severe inflammatory infections in humans due to sulfate reduction. Desulforedoxin (Dx) is an iron-dependent protein and plays fundamental role in the process of sulfate reduction, leading to inflammatory bowel diseases in humans. The present study aims at the mechanistic analysis of iron substitution in Dx protein with cadmium, gallium and mercury, and its effect on sulfate reduction mechanism. Metal substituted complexes are retrieved from protein data bank and single point energies are calculated for each complex,

using ORCA (3.0.1) adapting density functional theory (DFT) exchange correlations, with various basis sets. Interaction of each metal within the metal coordination site (MCS) of Dx is analyzed using molecular orbital energy descriptors i.e. ELUMO and EHOMO. Based on results, it was observed that iron is the most strongly bound metal in the MCS of Dx. Reactivity of the iron with the protein is highest among all the other metals as difference of ELUMO and EHOMO was lowest as compared to other metals. In contrast, gallium, cadmium and mercury showed weak binding with Dx. Based on results, it is concluded that iron is the least sulfate reducing as compared to other metals which reduces the chance of inflammatory bowel diseases occurrence.

Molecular docking and DFT studies revealing inhibitory action of phytochemicals against glycoproteins from Chikungunya virus

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Chikungunya virus (CHIKV) has emerged as a threat to human health, characterized by fever leading to potentially life-threatening and debilitating arthritis. The envelope glycoproteins of CHIKV play fundamental roles in the attachment and entry of virus in host cells. The present study explicates the inhibitory potential of selected 980 phytochemicals against two viral glycoproteins i.e. E1 and E2 from CHIKV. Pharmacological properties of all the phytochemicals were analysed using PreADMET webserver and thus screened suitable compounds were docked against the proteins using AutoDock Vina. Molecular orbital energies were calculated for the docked compounds, having binding affinity = -7.0 kcal/mol, adapting the B3LYP hybrid exchange correlation functional with def2-SV(P) basis set in ORCA (3.0.1). Among those 980 phytochemicals, fifteen were selected as potential inhibitors against glycoproteins i.e. seven flavonoids, four terpenes, two phenols and two lignans. These fifteen compounds are highly druglike and non-toxic in nature. The binding affinities ranged from -7.0kcal/mol to -9.8kcal/mol and the band energy gaps were within range of -110kcal/mol to -135kcal/mol, reflecting the strong inhibitory role with high reactivity. Based upon the results, it is concluded that the selected fifteen phytochemicals are highly competent to impede the proliferation of CHIKV.

L-asparaginase from *Pyrobaculum calidifontis* (P_cal 0970) as predictable drug for Acute Lymphoblastic Leukemia (ALL)

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Acute lymphoblastic leukemia (ALL) is an atrocious worldwide problem which is usually caused by the un-control production of white blood cells that is eventually due to the accumulation of asparagine in the absence of L-asparaginase. The efficient L-asparaginase is required to treat such acute cancer due to its anti-tumor and anti-proliferative activity. The L-asparaginase from E.coli and Erwinia chrysanthemi are commonly used but for the better results, stable and non-toxic L-asparaginase, enzyme from an archaeal specie i.e. Pyrobaculum calidifontis with ORF P_cal 0970 is tested computationally. The archaea being thermostable mostly provides more stable and efficient enzymes. The L-asparaginase from the human and Erwinia chrysanthemi, reference drug, are compared with the observed enzyme. The structure has been built using molecular modelling while the molecular dynamics simulations were performed to define the stability of predicted model. The docking process upon competence with other species enzyme refereed the active sites along with the binding at active sites using receptor-ligand interaction. The toxicity and physico-chemical properties along with the observation of allergens, antigenicity using B-cell epitopes and immunogenicity using T-cell binding of reference drug enzyme and observed enzyme are analyzed and compared. The non-toxicity, low molecular weight, better stability, long half-life, non-allergens, better antigenicity and immunogenicity as compared to the reference drug, predicted it to be useful as drug for acute lymphoblastic leukemia along with the other lymphoblastic cancers.

Evaluation of Antifungal Activity of Anaerobic Digestate and its Effect on Growth and Yield of Maize

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Pakistan is an agricultural country. Different crops are being produced day by day in agriculture sector but unfortunately, these crops are being infected by different microbes which not only retard its growth but also its yield. To overcome these problems a new and promising method is introduced i.e. Anaerobic digestate which has potential to combat the fungal pathogens without harming the environment and can be utilized as biofertilizer. Anaerobic digestate is partially degraded organic matter that comes from anaerobic digestion process. The present study was aimed to evaluate the antifungal activity of anaerobic digestate against selected phytopathogens. In the present study, antifungal activity was determined using microtiter plate methods against five selected strains of root pathogens. This method facilitated to determine the Minimum Inhibitory Concentration (MIC) and Minimum Fungicidal Concentration (MFC). Anaerobic digestate exhibited the 90 % inhibition against *Pythium ultimum* that is more than control, while it shows 70 to 68 % inhibition against *Rhizoctonia Solani* and *Bipolaris oryzae* respectively. MIC value was promising especially against *Pythium ultimum* and *Bipolaris oryzae* (6.5 mg·mL⁻¹). MIC value of anaerobic digestate ranged from 3.25 to 50 mg·mL⁻¹. There was no MFC observed against selected phytopathogens. It is concluded that anaerobic digestate is a renewable source that could be used as antifungal agents, it has a potential to inhibit the fungal growth that is responsible for infection in plants. Keywords: Anaerobic digestate, Antifungal activity, MIC, Phytopathogens.

BIOCONVERSION OF AGRICULTURAL WASTES TO POLYHYDROXYBUTYRATE BY AZOTOBACTOR VINELANDII

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Polyhydroxybutyrate (PHB), a biopolymer, has attracted the attention in the recent years due to its ability to replace the polyethylene, a non-biodegradable plastic. The aim of the present study was to evaluate the potential of different agricultural wastes like wheat bran, rice polishings and molasses for the synthesis of polyhydroxybutyrate (PHB) by *Azotobacter vinelandii*. The optimization of different carbon sources and various physical parameters was also performed. Highest yield of PHB was obtained by fermentation of 4% (w/v) wheat bran after 48 hours of incubation with 4% (v/v) inoculum volume at pH 7.0 and 37°C. Among different nitrogen sources tested, 0.2% peptone gave the better yield (285 mg/100 mL) while yeast extract decreased the amount of PHB. The outcomes of the present data indicate that agricultural wastes can be used for the production of polyhydroxybutyrate that will help in the solid waste management.

Evaluation of Microalgae for Biofuels Production

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The depletion of fossil fuels and the risk of global climate changes had led mankind to search for alternatives regarding its energy supply. Biofuels play an important role in alleviating CO₂ emission, decreasing global warming and acting as low cost alternative in comparison with the rising prices per barrel of petroleum. The idea of using microalgae as a source of biofuel is presently drawing attention in many countries due to its higher productivities in diverse environments, fewer toxic emissions and higher biomass yields coupled with relatively high

lipids, carbohydrates and nutrients contents. The aim of present study was to optimize the growth conditions of microalgae for maximum biomass productivity and biofuel potential. The microalgae strain A2 was cultivated at different concentration of media nutrients (nitrate and phosphate) and pH. Strain A2 gave maximum biomass production 0.29 g L⁻¹ day⁻¹ in BG11 media having nitrate and phosphate concentration 2.25g NaNO₃, 0.06g K₂HPO₄ and pH 8. The specific growth rate $\hat{\mu}$ of strain A2 was 0.146 $\hat{\mu}$ /day, lipid content was 22% and volumetric lipid productivity was 63.8mg/L/day. The biogas yield of residues left after lipid extraction was higher than whole biomass of microalgae. The biogas yield, methane yield and percent methane content of whole biomass was 527.22 Nml/g VS, 353 Nml/g VS, 67% and 568.93Nml/g VS, 386 (Nml/gVS) and 68% respectively was calculated for residues after 50 days. Biodiesel was produced from oil of microalgae by using whole cell approach for enzymatic transesterification. 83% volumetric yield of biodiesel produced from algal oil and was confirmed through FTIR.

ISOLATION AND CHARACTERIZATION OF POTENTIAL CADMIUM TOLERANT *ESCHERICHIA COLI* FROM TANNERY WASTEWATER

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Environment is getting polluted due to man-made activities and other natural sources at a very high rate. Heavy metals including nickel, zinc, chromium and cadmium are renowned metals of industrial wastewater which excrete out into the environment and as a result polluting the environment. The present investigation deals with isolation and characterization of cadmium tolerant bacteria from tannery wastewater taken from industrial area of Lahore, Pakistan. Firstly the leather industry effluent was examined for the total bacterial count and the presence of lactose fermenter and non lactose fermenter species on nutrient agar and MacConkey agar. Potential heavy metal tolerant *Escherichia coli* was isolated by using Eosin methylene blue

(EMB) agar medium supplemented with salts of cadmium. The examination of morphological features of the obtained colonies authentically identified the isolate as *Escherichia coli*. The identified isolate was then exposed to different concentrations of cadmium chloride to conclude the minimum inhibitory concentration (MIC) which was found out to be 120mg/mL.

Current Status of Anaerobic Digestion Technology in Pakistan

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Pakistan, like most of the developing nations, is facing energy crises. Every year a large amount of the country economy is expended on the fossil fuels to meet the energy demands. The renewable energy sources like solar energy, wind energy, biomass energy and fuel cell technology can be utilized to fulfill the energy needs. Recently, biomass is gaining interest as a promising renewable energy source due to its potential to produce biofuels of high calorific value such as bioethanol, biohydrogen, and biogas etc. via anaerobic digestion and other technologies. Anaerobic digestion is an economical and environmentally friendly process that aims to produce renewable energy like biogas and fertilizers with high nutrients recovery and low greenhouse gas emission. The current energy demands can be partially fulfilled through the development of biogas plants which will reduce our dependency on fossil fuels. In this presentation, the current energy crises in Pakistan will be highlighted. for biogas production in overcoming the energy needs and issues of waste management of the region. Second generation biogas production from lignocellulosic biomass is more attractive option than production of ethanol. Pakistan has established infrastructure for natural gas supply, which can be utilized for biogas production. In presentation we will also discuss some novel approaches for upgrading biogas in order to utilize compressed biogas (CBG) as alternative of CNG. The need of a national policy is considered a vital step to bring this technology at farmer doorstep.

Activation cross-section of Nickel and Application of its Nuclear Data

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Production cross-sections of the ${}^{nat}\text{Ni}(p/d,x){}^{60,61}\text{Cu}$, ${}^{56,57}\text{Ni}$, ${}^{55,56,57,58}\text{Co}$ nuclear reactions were measured by using a stacked foil activation technique. The results were compared with the available literature values, predictions of the nuclear reaction model codes ALICE-IPPE, TALYS, and extracted data from the TENDL library. Spline fits were made on the basis of selected data, from which physical yields were calculated and compared with the literature values. The applicability of the ${}^{nat}\text{Ni}(p/d,x){}^{57}\text{Ni}$, ${}^{57}\text{Co}$ reactions for thin layer activation (TLA) was investigated. The applicability of the beam monitor reaction will also be analysed.

Processing of Organic Waste through Composting

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Organic waste (including kitchen, garden/lawn, and agricultural waste) composting has been done in the current study in which different methods like static piles and pit composting have been applied to suggest the best method for managing the waste. These conventional methods were used with some innovations to increase the efficiency while keeping the process cost effective. Four main experiments, soil microbes assisted static pile composting, urea spiked browns composting using static pile, aerobic pit composting with enclosed passive aeration, have been carried out. Initial analyses of waste i.e. weight, moisture content and bulk density measurements were carried out to maintain best balance of C/N ratio and moisture. The experiments were then established followed by daily measurement of temperatures, weekly measurement of evolved CO₂, weekly turning and application of moisture if needed. After the

formation of compost Physico-Chemical analysis, color, moisture content, bulk density, water holding capacity, pH and electrical conductivity, were carried out. On the basis of results of all four experiments, it was concluded that application of soil proved to be very helpful as seed compost in a static pile showing good results. Soil pit composting with modification of passive aeration also showed good results.

Development of a model for the description of the viscosity of bio-oil produced by fast pyrolysis of the wheat straw

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The aim of this work is to evaluate the role of viscosity of the organic condensate obtained from wheat straw. Based on the experimental data, a model has been developed that is able to adequately describe the viscosity as a function of relevant process parameters. The developed model is helpful to investigate the drop of heat transfer in the heat exchangers of the organic condensate cycle when glycol is replaced by an organic condensate. Glycol is used as preliminary material during start-up of the plant and has a different viscosity than the organic condensate. Temperature, solid contents and water contents play a significant role and affects the viscosity of bio-oil. As temperature increases, the viscosity of oil reduces rapidly. Viscosity-temperature profile follows an Arrhenius-type-relationship, where the viscosity of the bio-oil decreases exponentially with increasing temperature. As solid content increases, exponential increase of viscosity takes place. However, the increase in water content results in decrease of viscosity on logarithmic scale. The range of water addition in organic condensate is possible up to a certain limit, after certain limit it starts to separate out in two phases. Investigation of drop of heat transfer in heat exchanger shows that Nusselt number decreases with the increase of viscosity. Therefore, the overall heat transfer coefficient will decrease in case of organic condensate as compared to glycol.

Chemical characterization of Black stones from the 17th century Mughal Architecture

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The historic fabric should be preserved in their original styles and materials. The replacement materials should be carefully selected in terms of physical, chemical, mechanical and aesthetic compatibility. Therefore the present study characterized the historic black colored stones from the 17th century Mughal architecture. The collected samples were initially studied with optical microscopy and X-ray powder diffraction which was further supplemented by SEM-EDS. The chemical compositions were further elaborated with XRF and inductively coupled plasma atomic emission spectroscopy to measure the major element content in addition to trace elemental analysis. The results showed that there were two different groups of black stones (Group-I Limestone and Group-II Slates) used in the historic structures.

Synthesis and Study of Time-resolved Photoluminescence of chalcone Fluorophore

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3,3'-((thiophene-2,5-diyl)bis(1-(4-nitrophenyl)prop-2-en-1-one)) is synthesized and its steady-state and time-resolved photoluminescence (PL) are studied. It exhibited a bright yellow fluorescence with emission life-time of approximately ~4 ns in chloroform at room temperature. The PL was measured by pulse LED laser excitation source, PLS-300, centered at 305 nm with full width half maximum (FWHM) of ~416 ps and pulse energy 0.077 pJ.

(thiophene-2,5-diyl)bis(1-(4-nitrophenyl)prop-2-en-1-one) compound showed long lived PL with an average PL life-time ~4 ns. This indicates that it is suitable for DSSC.

Synthesis and optical study of novel ligands with different transition metals

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This research work deals with the synthesis of novel carboxylates ligands which will be further used to design new complex structures of different metals. Metal complexes are emerging on the interface between material science and coordination chemistry. Metal complexes are the important class of materials of one, two, or three dimensional networks formed by multidentate organic linkers and metal ions. In this study first some novel carboxylates will be synthesized and then with different combinations of metals and solvents new complexes will be synthesized with different metals. The present research provides an efficient, simple and environment friendly synthesis methods. The cost effective approach will also be adopted by carrying out the synthesis under ambient temperature and pressure conditions and novelty will be induced by designing new ligands. The newly made complexes will be characterized by using different techniques such as Fourier transform infrared spectroscopy (FTIR) and UV-visible Spectroscopy.

Enhanced Photocatalytic Activity of Graphitic Carbon Nitride

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Synthesis, Spectral Characterization and Photocatalytic Applications of Sulfur-Doped Graphitic Carbon Nitride Nanocomposite with Copper Doped Zinc Oxide. Salma Asif, Mohsin Javed*
Abstract ZnO and copper-doped ZnO nanoparticles were synthesized by co-precipitation method

by varying the amount of Cu (1, 3, 4, 5 and 7 wt %) of copper nitrate while zinc acetate and copper acetate were used as Zn and Cu precursors respectively. Sulfur doped graphitic carbon nitride was synthesized by heating thiourea at 550°C in muffle furnace. Finally the photocatalyst was prepared by making composite of Sulfur doped graphitic carbon nitride with copper-doped ZnO nanoparticles. The structural and morphological properties of photocatalysts were studied by FTIR, TEM, SEM, XRD, EDS. Photocatalytic activity of the synthesized nanomaterials was successfully tested for photodegradation of methylene blue as model pollutant under UV light. The photocatalytic activity results confirm that the nanocomposite photocatalyst show higher activity than the individual nanoparticles.

Detection of Pesticides in Different Matrices Using High Performance Liquid Chromatography-Tandem Mass Spectrometry

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ABSTRACT: The modern era of analytical chemistry reveals that researchers are trying to develop more efficient, quick and easy methods for the analysis of a variety of compounds they are interested in. Recent advances in high performance liquid chromatography-tandem mass spectrometry (LC-MS/MS) technology have provided an opportunity for the development of more specific analytical methods for the detection of analytes of interest qualitatively as well as quantitatively in a single run. In this study, a unique method was developed for the detection of pesticides in different matrices like, biological specimens (blood, urine, liver and stomach contents), water and food samples using LC-MSMS technique with electrospray ionization (ESI) source. Prior to detection on instrument, sample preparation method involved the promising use of QuEChERS extraction method that saves both time as well as cost due to reduction in solvent consumption which are troubling during conventional liquid-liquid extraction method. Both sample cleaning and maximum recoveries were achieved by using QuEChERS extraction method. This new method is applicable in various analytical laboratories specially in forensic toxicology, food testing laboratories and water testing laboratories.

CHARACTERIZATION OF SUNFLOWER OIL FOR ITS OLEIC ACID CONTENT

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Sunflower is one of the most significant plants famous for their oils. Sunflower oil is reputed for its positive health effects. Physicochemical analysis of sunflower oil was carried out in which saponification value, acid value and ester values were calculated. The results shows these values to be 191.675, 0.94 and 190.735 respectively. GC-MS analysis of sunflower oil shows the presence of Oleic acid as a major component. Other Components identified were; p-Toluylic acid, Pregn-4-en-18-oic acid, 11-(acetyloxy)-6,7-epoxy-9,20-dihydroxy-3-one, gamma.-lactone, 1,2-Benzenedicarboxylic acid, Benzoic acid, 2,4,6-trimethyl-, 2,4,6-trimethylphenyl ester and Linoleic acid. The presence of reasonable amount of Oleic acid in given sunflower oil sample proves it to be healthier for use in human diet. The rest of components identified can also provide a good scope of research in finding the further applications of sunflower oil.

Surfactant Assisted Synthesis of Nanocrystalline Nickel Oxide and its Bioactivities

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Nanoparticles research is growing widely as they can be easily altered by changing their shape, size and chemical properties. Nickel is more commonly found in ores and sometimes found free in nature. It is electrically $\hat{A}\rightarrow\hat{A}$ -conductive and hence used for several applications. Nickel nanoparticles are difficult to prepare as they readily oxidize. Elevated temperature (550 \hat{A} $^{\circ}$ C) and capping agent is used to enhance its stability. The optical properties of capped Nickel oxide

powder were characterized using UV-VIS-spectrophotometer. The powdered nanoparticles were characterized by, Fourier transform infrared (FT-IR) spectroscopy, X-ray diffraction pattern (XRD), transmission electron microscopy (TEM) and scanning electron microscopy (SEM). The surfactant assisted nanocrystalline Nickel oxide powder have various uses in industry due to its catalytic, antibacterial and dye degradation properties. Antibacterial Activities of Nickel oxide nano crystalline powder checked by Agar well diffusion assay against Gram +Ve and Gram -Ve bacteria proved them to be future broad spectrum antibiotics..

Copper Nanoparticle as an alternative for Amoxillin Antibiotic.

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The antibacterial activity of copper nanoparticles were studied by Agar Disc Diffusion method. Copper nanoparticles were synthesized by wet chemical method using copper sulphate pentahydrate and sodium lauryl sulfate and hydrazine as reducing, synthesized nanoparticles were determined by XRD characterization technique. The antibacterial activity of copper nanoparticles for different dilutions were reported against *Eschericia coli*, *Streptococcus mutans*, *Staphylococcus aureus*, *Pseudomonas* and *Klebsiella pneumonia* bacteria whereas Amoxicillin was used as standard antibiotic for comparison of their activity and results showed that Copper nanoparticles has highest activity against *Klebsiella pneumonia* and lowest efficiency against *Pseudomonas*. As Copper nanoparticles has better antibacterial efficiency as compared with standard antibiotic it can also be used as antibiotic.

Photocatalytic degradation and biological evaluation of copper doped zinc oxide nanoparticles

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Pure copper oxide, zinc oxide and copper doped zinc oxide nanoparticles (5 %, 10 %, 15 %, 20%, 25%) are synthesized by co-precipitation method. Zinc sulphate ($ZnSO_4 \cdot 7H_2O$) and copper sulphate ($CuSO_4 \cdot 5H_2O$) are used as starting material. The prepared particles are characterized by TEM and XRD. TEM results show the non-uniform shape of particles. TEM and XRD results show the size range of 50 nm, 100 nm and 200 nm for copper doped ZnO nanoparticles. The size of copper oxide and zinc oxide nanoparticles is 11.8 nm and 58.3 nm. The diffraction angles (2θ) are revealed by XRD at 37.27° for CuO, 36.74° for ZnO and 59° (15 %), 36° (25 %) for copper doped ZnO nanoparticles. The degradation activity on organic dyes (methylene blue and erichrome black T) in the presence of catalyst, reveals the effectiveness of copper doped zinc oxide nanoparticles by gradual decrease in absorption peaks. UV results reveal that Cu-doped ZnO nanoparticles are more effective to degrade the organic dyes as compared to pure copper and zinc oxide particles. Antimicrobial activity was performed by using well diffusion method. It was confirmed by inhibition zones that copper doped zinc oxide nanoparticles (25 %) are efficient antibiotic agents.

Synthesis, Spectral Characterization and Photocatalytic Applications of Sulfur-doped Graphitic Carbon Nitride Nanocomposite with Silver-doped Zinc Oxide

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In this study, ZnO nanoparticles as well as silver-doped zinc oxide nanoparticles were prepared by co-precipitation method by varying the amount of silver (3, 5, 7 and 10 wt %) of silver nitrate. Furthermore, these nanoparticles were made composite with sulfur-doped graphitic carbon nitride (g-C₃N₄). Each sample was characterized by XRD, FTIR, SEM, TEM and XPS techniques to find out its morphology. The photocatalytic activity of the samples was testified via photodegradation of methylene blue (MB) as a standard dye. For this purpose, the concentration of MB used was taken to be 2.8×10^{-6} M. The quantity of photocatalyst sample

used was 0.05 grams. It was observed that the composite of sulfur-doped g-C₃N₄ with silver-doped ZnO show much enhanced photocatalytic performance as compared to any other sample acting as alone.

CO-ORDINATION OF METAL IONS WITH INDOLE-3-ACETIC ACID; SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL SCREENING

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Metal complexes with carboxylate ligands have been fascinating field of research because carboxylate group demonstrates diverse modes of coordination and exhibit non-identical bonding towards metal cations. In addition, the transition metals have maximum number of empty d-orbitals and acquire stability by getting electrons from ligands in the form of dative bond. As a result, metal-ligand complex form. In present work, a series of transition metal complexes of indole-3-acetic acid as primary ligand with various secondary ligands was synthesized by reflux method. The complexes were analyzed by several techniques such as FT-IR, UV-Visible, NMR and conductance measurement. From conductive measurement, it was revealed that all synthesized complexes are non-electrolytic in nature. Antibacterial activity was performed by the well diffusion method against gram negative (*Klebsiella pneumoniae*, *Escherichia coli* and *Pseudomonas aeruginosa*) and gram-positive (*Staphylococcus aureus*) bacteria. All complexes exhibited higher antimicrobial potential than ampicillin (standard reference drug). It was confirmed by inhibition zones that metal complexes are efficient antibiotic agents.

Green Synthesis of Zn-doped CuO nanoparticles by Gallic Acid

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In this present study the aim is to synthesize and characterize the zinc doped CuO nanoparticles by using gallic acid and examined molar concentration effect on the particle size. Zn-doped CuO nanoparticles synthesized by chemical reduction method (CRM) in de-ionized water as solvent by changing the concentration of their salts on a green route. CuO nanoparticles were purified and dried. The morphology and structural analysis of nanoparticles were confirmed by fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), X-Ray diffraction (XRD) and energy dispersive X-ray spectroscopy (EDX). The size of Zn-doped nanoparticle is greater than nanoparticle.

GC-MS STUDIES OF ESSENTIAL OIL OF PEGANUM HARMALA AND THEIR ANTIOXIDANT ACTIVITY

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Peganum harmala L. commonly identified as hurmur or harmal, belongs to the family zygophyllaceae. It is an important medicinal plant which have been used in the past for the treatment of ailments. Now it is also used for the same purpose but researchers have separated its chemical constituents and are trying to sort these components along with their potential to cure diseases. Its main components are harmine, harmaline, anthraquinones, saponins and flavonoids. The aim of this study was to extract the essential oil from the leaves and seeds of *Peganum harmala* L. by hydro-distillation using Dean-Stark apparatus and to characterize this oil by GC-MS. Antioxidant and antibacterial activity was determined by the essential oil of seeds and leaves. Best antioxidant activity was revealed by the essential oil at 100 $\mu\text{g/mL}$ with the percentage inhibition 98.085 of DPPH. Antibacterial activity was determined by essential oil against four bacterial strains but best activity was revealed against *Staphylococcus aureus* and *Escherichia coli* by well-diffusion method. This showed the medicinal properties of essential oil *Peganum harmala* L. against bacteria and oxidative species which produced in the body.

Hepatoprotective Activity of Pistachia khinjuk

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In this research the objective was to test the hepatoprotective activity by the induction of CCl₄ to the Swiss Albino Mice. The seeds extract in different doses 100 mg/kg, 250 mg/kg, 500 mg/kg were given orally to albino mice groups for fourteen days and on 15th day mice were dissected and blood was taken in EDTA tubes and livers were preserved in Formalin solution. The blood was tested by ALTs kit. It was observed that the levels of serum enzymes such as Serum Glutamate Oxaloacetate transaminase (SGOT), Alkaline Phosphate (ALKP), Serum Glutamate Pyruvate Transaminase (SGPT), and bilirubin levels were decreased and silymarin was used as a standard drug. The results revealed that, the values of SGOT, SGPT, ALKP and Bilirubin were 61.05, 57.55, 138.31, 0.91 for positive control group, 85.48, 55.29, 138.31, 0.46 for negative control group, 119.99, 107.09, 151.96, 1.43 for P.khinjuk group (100 mg/kg), 89.89, 94.41, 191.46, 1.09 for P.khinjuk group (250 mg/kg) and 69.47, 72.21, 164.35, 0.79 for P.khinjukgroup (500 mg/kg) respectively. The results of this study on the seeds extract of Pistacia khinjuk confirmed excellent hepatoprotective activity against CCl₄ damaged liver in albino mice.

Synthesis, characterization and alkaline phosphatase studies of Zn(II), Cu(II), VO(IV) and Cd(II) carboxylates

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Ligand [(e)-4-((3,5-dichlorophenyl)amino)-4-oxobut-2-enoic acid], its sodium salt and four new transition metal carboxylates have been prepared and characterized by FT-IR, conductometry and UV-Visible spectroscopy. FT-IR spectroscopy proved that only carboxylic group was involved in complex formation. Molar conductance revealed that all the compounds are non-

electrolytic in nature. UV-Visible spectra proven that all the compounds appeared in UV region have shown p-p* and n-p* transitions. All the products have shown inhibition activity against alkaline phosphatase.

A wild aquatic plant, Eichhornia Crassipes and polyethylene

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A wild aquatic plant, Eichhornia Crassipes and polyethylene have been converted into liquid product thermo-catalytically and cost effectively through co-pyrolysis using batch steel pyrolyzer. The Fe and CaCO₃ catalysts were obtained as wastes from various mechanical processes. The catalytic process was compared with Non-catalytic pyrolysis. The effect of various reaction conditions was investigated in order to find out the optimized process conditions. It was found that the favorable reaction conditions were 450°C temperature and 1 hour reaction time at a heating rate of 1°C/s and 0.4mm biomass particle size. The bio-oil yield was found to be 34.4% and 26.6% using Fe and CaCO₃ respectively with catalysts particle size of 0.4mm at the optimized reaction conditions and 5wt% of biomass. The Non-catalytic and catalytic co-pyrolysis using Fe as catalyst produced 23.9% and 28.7% oil respectively. Thus the efficiency of processes in terms of bio-oil production was found in order of: Fe > CaCO₃ > Non-catalytic pyrolysis. The GC/MS analysis of n-hexane extract of bio-oil shows that Fe catalyst favors formation of aliphatic hydrocarbons while CaCO₃ and non-catalytic pyrolysis favors formation of aromatic hydrocarbons. Mostly unsaturated aliphatic hydrocarbons were formed in case of co-pyrolysis reactions. The calorific value of bio-oil was also measured in order to find out the fuel properties of the products.

Effect of Process Conditions on Production and Composition of Bio-oil

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Effect of Process Conditions on Production and Composition of Bio-oil Obtained from Catalytic Pyrolysis of Water Hyacinth Biomass?? ABSTRACT The Water Hyacinth biomass has been converted into bio-oil using waste Cu and Al catalysts. Parameters like temperature, time and particle sizes of biomass and catalyst were optimized. The temperature was used from 150-450°C and the reaction time was in the range of 60-100 minutes. The amount of catalyst was kept constant as 5wt% of biomass for all the reactions. The results showed a profound effect of the biomass and catalyst particles size on the overall conversion. A maximum of 31.6% bio-oil was produced using Cu catalyst at the optimized conditions. The Cu catalyst was found more effective in terms of the bio-oil yield. GC-MS and FTIR analyses were carried out in order to characterize the bio-oil. The composition of bio-oil reveals that the Al catalyst is more selective in gas and light hydrocarbons production. The Cu catalyst selectively produced aliphatic hydrocarbons and the Al catalyst favored formation of aromatic hydrocarbons.

Study of Antibacterial Activity of Ziziphus Sativa

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The scientists select the different plants for screening their components that helped to control the bacterial growth. Ziziphus sativa belonged to Rhamnaceae family. The common name of ziziphus sativa is berry in Persian it is known as ziziphus lotus. Ziziphus sativa is traditionally important medicinal plant. The antibacterial activity of ziziphus sativa was checked by the disc agar diffusion method. Four different solvents extracts (n-hexane, chloroform, ethyl acetate and aqueous) was used to check the antibacterial effect. Klebsiella pneumoniae, Staphylococcus

aureus, Streptococcus mutans, Streptococcus pseudopneumoniae and Escherichia coli were used to analyze the antibacterial effect. All the strains showed antibacterial effect except Streptococcus mutans. While the ethyl acetate showed the best result among all extracts. Ethyl acetate showed 70mm zone of inhibition in 1% of plant extract while n-hexane extract showed no results against Klebsiella pneumoniae, Staphylococcus aureus, Streptococcus mutans and Streptococcus pseudopneumoniae strain. So it is concluded that ethyl acetate, chloroform, aqueous and n-hexane extract of ziziphus sativa can be served as antibacterial agent

Low cost activated carbon for removal of chromium from aqueous media

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The potential use of different activated carbons prepared from biomass for the removal of chromium was studied. Biomass was converted into different type of activated carbon by chemical activation method using BaCl₂ as activating agent. The factors affecting on adsorption of activated carbon including concentration, particle size, anion, activating agent and pH effect on adsorption were investigated. The performances of the activated carbon were good.

Synthesis of Tetrahydrocarbazole Linked 3,4-Dihydropyrimidin-2(1H)-one

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In recent years, functionalized pyrimidinones are constantly grabbing the attention of researchers because of their specific and characteristic bio-properties like antihypertensive, antimicrobial, anti-inflammatory etc [1]. Substitution pattern at different positions of pyrimidinone is important in deciding the pharmacological profile of this unique nucleus. Owing to wide range of applications, synthesis of diversified pyrimidinones has become an essential challenge for

synthetic chemists [2]. A novel series of tetrahydrocarbazole linked 3,4-dihydropyrimidin-2(1H)-one have been synthesized by the reaction of acetyl tetrahydrocarbazole, aromatic aldehydes and urea under reflux conditions using sulfanilic acid as mild and easily removable catalyst. Multicomponent approach was employed for good yield in less tedious procedures. Structural characterization was achieved through spectroscopic techniques like FTIR, MS and ¹H-NMR.

Ice, A New Drug In Pakistan

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Ice (methamphetamine) belongs to the class of amphetamine type stimulants. It is illicitly manufactured in clandestine laboratories. It is strong stimulant of central nervous system. Its manufacturing, possession, trafficking, distribution and sale have been restricted and controlled not only in Pakistan but internationally as well. Here we proposed a method for the detection and quantification of methamphetamine manufactured in Pakistan. The proposed method is quiet easy, simple, cost effective, require no complex methodology for sample preparation and its results are quiet reliable, accurate and reproducible. The detection of methamphetamine was done by Gas Chromatography- Mass Spectrometry (GC-MS) and Fourier Transform Infrared

Spectroscopy (FTIR). The quantification of methamphetamine was performed by using UV-Visible Spectrophotometer and all the parameters like accuracy, precision, linearity, reproducibility, limit of detection, limit of quantification etc were validated. The linearity range was 100 $\hat{\mu}$ g/ml to 1000 $\hat{\mu}$ g/ml and the observed lambda max was 259 nm. The calibrators were stable for continuous 4 days. The limit of detection was 50 $\hat{\mu}$ g/ml and limit of quantification was 100 $\hat{\mu}$ g/ml. The absorbance showed by methamphetamine in UV-Visible range is due to p to p* transition. FTIR spectrum showed that sample was 88 % pure and that of GC-MS showed that sample contain 83% methamphetamine.

Pistachia khinjuk shows antidiabetic activity

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The present study evaluates the hypoglycemic effect of Pistachia khinjuk from the extract and wax of Pistachia khinjuk individually. Six groups of Swiss albino mice were made for wax and extract of Pistachia khinjuk separately and each group contains six albino mice. All the mice were injected alloxan monohydrate except normal group of wax and extract. Group 1 was treated as normal group and receives no treatment, group 2 receive 5mg/kg of glibenclamide after alloxan monohydrate induction, group 3 receive no treatment after alloxan monohydrate induction, group 4, 5 and 6 receive 500(extract), 250(extract) and 500(wax) mg/kg of Pistachia khinjuk after alloxan monohydrate treatment. Almost all the mice for wax (Pistachia khinjuk) of group 4, 5 and 6 show gradual increase in their diabetes while all the mice for extract (Pistachia khinjuk) of group 4, 5 and 6 show hypoglycemic activity and decreases blood glucose level. Present study indicated the hypoglycemic effect of Pistachia khinjuk for extract but for wax of Pistachia khinjuk thereâ€™s no evidence of hypoglycemic effect. There may be many factors behind this activity which needs more research on it by detecting and analyzing specific compound which cause this effect.

"Synthesis, Characterization and Biological Activities of Zn, Cd, Cu and Co complexes of Sodium-Phenylcarbamdithioate"

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By the reaction of primary amine with CS₂ in the presence of Na₂CO₃, sodium-phenylcarbamdithioate was prepared under the aqueous condition. From sodium-phenylcarbamdithioate the eight new metal complexes [Zn(dtc)₂], [Cd(dtc)₂], [Co(dtc)₂], [Cu(dtc)₂], [Zn(dtc)₂(en)₂], [Cd(dtc)₂(en)₂], [Co(dtc)₂(en)₂], and [Cu(dtc)₂(en)₂] have been synthesized. The synthesized compound have been characterized by FT-IR and conductometer while the biological activities were performed by Alkaline phosphatase Assay (ALP) and anti-bacterial activity. The formation of ligand was confirmed by the appearance of C-S peak at 998 cm⁻¹, which was shifted to lower wave number (at 983-872 cm⁻¹) upon complexation. Metal-sulfur coordination was confirmed by the observed the vibrational frequency of N-CSS at 1431-1471 cm⁻¹. From ALP profile, it was observed that the activity of enzyme becomes low by increasing the concentration of a metal complex. Among all complexes, [Cu(dtc)₂(en)₂] at 98.69 and [Zn(dtc)₂(en)₂] at 98.14 shows the highest ALP inhibition. By well diffusion method, antibacterial activity of synthesized compounds were performed against gram negative (Klebsiella pneumonia, Escherichia coli and pseudomonas aeruginosa) and gram positive (Staphylococcus aureus) bacteria from which it was revealed that all synthesized compounds were act as antibiotic agent. From conductive measurement, it has been cleared that all prepared compounds are non-electrolytic in nature.

Discovery of Schiff-base Derivatives of Ferrocene and Their Transition Metal Complexes as Alfa glycosidase activity

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The novel ferrocene-based thiosemicarbazones were synthesized in good yield by the condensation of thiosemicarbazides with acetylferrocene. Transition metal complexes (Cu(II), Zn(II), Co(II), Ni(II)) of novel compounds were then synthesized and their inhibition against Alfa Glycosidase was examined. These compounds and their complexes demonstrate moderate to potent inhibition activity against the said enzymes. Cu(II) complexes showed high inhibition against than their respective ligands or with the complexes of other metals. Co(II) complexes also showed potent inhibition of enzymes but with slightly higher IC₅₀ values than that of Cu(II), Zn(II) and Ni(II) complexes.

Hydrogel covered bimetallic Co:Ni magnetic nano alloy for protein adsorption in biomedical application

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In this study, polyacrylamide (PAAm) hydrogel covered CoNi magnetic nanoalloys with various Co/Ni molar ratio (from 1/4 to 4/1) were synthesized, characterized and used for adsorption of Bovine Serum Albumin (BSA). XRD, EDS, VSM, SEM, AFM, Automated Gas Sorption Analyzer and Fluorescence measurements were used for characterizations and adsorption studies. The results confirm that all the synthesized nanoalloys have soft ferromagnetic nature and particles size were determined to be in the range of 8.60e12.19 nm. Adsorption performances of magnetic nanoalloys were investigated on bovine serum albumin (BSA) as a model protein. The results showed that prepared CoNi:PAAm composites have multistage adsorption kinetics for BSA and increasing Ni content in the CoNi nanoalloys enhance the adsorption rate constant and the rate constant can be tuned between 0.003 s⁻¹ and 0.009 s⁻¹ and

between 0.01 s^{-1} and 0.60 s^{-1} for the first order adsorption and the second order adsorption stages, respectively. These results show that CoNi:PAAm composites can open new pathways for preparing a special composite material which has specific adsorption kinetic for bio-separation technology.

Existence of solutions of nonlinear coupled boundary value problems

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In this article, the existence results for certain second-order nonlinear coupled ordinary differential systems involving nonlinearity in the first-order derivative terms are investigated applying coupled lower and upper solutions approach. we present a general approach of existence of solutions to cover various systems of boundary value problems in a unified way, which avoids treating these problems on a case-by-case basis. Schauder's fixed point theorem and Arzelà-Ascoli theorem play an important role in establishing the main results including in this article. The established theoretical results are verified by taking a test example.

Study of Hadamard k- Fractional Integral

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we introduce the Extended K-Hadamard fractional integral and then present its properties and some inequalities. When $k=1$ and $s=0$, these results hold true for Hadamard fractional integral. Mellin transform of Extended k-Hadamard fractional integral is also determined. Its boundedness in L_p spaces is also discussed.

Numerical Modeling of Hepatitis C Dynamics with Different Types of Virus Genome

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In this paper, a novel unconditionally stable Non-Standard Finite Difference (NSFD) numerical scheme is proposed and analyzed to investigate the Dynamics of Hepatitis C with Different Types of Virus Genome. Numerical experiments are performed and results are compared with standard finite difference schemes being already used to handle such problems. Well-known standard finite difference schemes are conditionally convergent and may lose some important features of the continuous dynamical system for certain values of time steps. The proposed numerical scheme is dynamically consistent with the biological nature of the continuous model and preserves all of its essential properties.

Numerical Modeling of Whooping Cough Dynamics with Diffusion

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This work concerns with the numerical solution of whooping cough model with diffusion. A new finite difference scheme is constructed to solve the model. The main feature of this scheme is to preserve positivity property which hold for the solution of the system. The other features of this scheme are 1) It is explicit in nature. 2) It is unconditionally convergent. Comparison with two classical schemes is presented. All the attributes are also verified by the simulations.

Fourth order numerical method for heat equation subject to the nonlocal boundary conditions

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We develop a numerical technique for solving one dimensional parabolic partial differential equation with integral boundary conditions. Spatial derivative is approximated by finite difference scheme and by applying method of line we get system of first order ordinary differential equation. Simpsons 1/3 rule is used to tackle integral conditions and we use it to remove additional variable to get a system of n equations with n variables. This method is time efficient due to availability of real arithmetic only . This numerical method can be coded on sequential as well as parallel computing environment .

Mathematical Induction is Actually a Deductive Technique

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Traditionally, the technique of mathematical induction has had been extensively and successfully used to prove the different mathematical theorems. But unluckily, its designation is a misnomer. Philosophically speaking, it has nothing to do with the notion of induction per se. When one probes into the character of mathematics, the use of the word induction runs counter to the very

nature of mathematics. Historically, both induction and deduction are the two offshoots of logic. The former deals with the corporeal world ‘a world in which observation is inevitable. Whereas the latter is related to the form of the nature ‘a world where there is no content or material. The results of deduction are necessary whereas those of induction are contingent. In this paper, we intend to argue the character of mathematical induction. Our contention is that it is purely a deductive technique. Different scenarios and case studies will be given to support our thesis.

Third Order Numerical Method for Heat Equation Subject to Integral Boundary Conditions

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In this paper, a third order numerical technique is developed for solving one dimensional non-homogenous heat equation with integral boundary conditions. In this method second order spatial derivative is approximated by third order finite difference approximation. The parallel splitting technique combined with Simpson’s 1/3 rule is used to tackle this problem. The algorithm has been developed for this method and tested on two model problems from literature. We conclude that our method provides better accuracy as compared to those techniques which are existing in the literature due to availability of real arithmetic.

Numerical Modelling of the hepatitis C with different Types of Virus Genome and the Effect of Time Delay

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In this paper, a mathematical model to study the spread of HCV-subtype 4a among the Egyptian population with the effect of time delay has been analyzed numerically. An unconditionally convergent numerical model has been proposed with the aim that discrete model must exhibit the same behavior as the continuous model. The proposed numerical model preserves all the essential properties of the continuous dynamical system like dynamical consistency, positivity and boundedness of the solution. The effect of time delay has also been studied to ensure the importance of precautionary measure and awareness in fast eradication of HCV.

Mathematics is actual Formal structure

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Most of the People has been aware with definition of mathematics traditionally but they don't know about the nature of mathematics. Math is the formal structure of Reality. Philosophers believe that elegance nature of math exists only in our thoughts and cognition. Numbers and geometrical forms doesn't exist physically but exists in the deep sea of mind. Math depends on mathematicians if there were no mathematician, Math wouldn't be exist. inventions and discoveries also specify the nature of math with formal structure.

Cracking of Charged PSR J1614-2230 in Quadratic Regime

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We present the cracking of compact object (CO) PSR J1614-2230 in the quadratic regime with electromagnetic field. For this purpose, we develop a general formalism to determine the

cracking of charged CO. We apply the local density perturbation (LDP) to the hydrostatic equilibrium equation as well as all the physical variables involve in the model. We plotted the force distribution function against the different values of radius and model's parameters both with and without charge. It is concluded that PSR J1614-2230 remains stable (no cracking) corresponding to different values of parameters when charge is zero, while PSR J1614-2230 exhibit cracking when charge is introduced. Further, we note that stability region decreases as amount of charge increases.

Dual hesitant fuzzy aggregation geometric bonferroni mean operator and its applications in multiple attribute decision making

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In this talk, dual hesitant fuzzy geometric Bonferroni mean is discussed for dual hesitant fuzzy sets. Different properties of dual hesitant fuzzy geometric Bonferroni mean are also discussed. Also talk about some special cases of dual hesitant fuzzy geometric Bonferroni mean. A multi-criteria decision making method is discussed to find the best alternative among, different alternatives by using proposed aggregated operator and an illustrated example is also given to understand our proposal.

CAGD using PDE Surfaces

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This paper presents a methodology for efficient shape preservation using elliptic Partial Differential Equation(PDE) formulation with four curves as the conditions to solve the PDE. We develop a simple method using PDE which is capable of retaining the shape of the original

geometry. We have introduced two parameters in order to solve the bi-quadratic PDE. It is shown how the choice of placement of the curves effect the overall structure of the model with fixed parametrisation and with varied parametrisation. The varied parametrisation is free from user's choice which depends purely on the placement of the curves.

Controlled Artificial Showering Optimization Algorithm for Global Optimization

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This article presents a novel meta-heuristic, called Controlled Artificial Showering Optimization Algorithm (CASO). It is inspired from the mathematics of working of sprinklers used in modern irrigation. The present work demonstrates the necessary mathematical structure of the algorithm and geometric presentation of working of CASO on highly decisive multimodal functions. The performance of CASO is found to be quite superior to the state of the art algorithms.

Odd Graceful Labeling of W-Tree

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Graph labeling is a paramount area of research in the theory of graphs. It is a one to one mapping that carries a set of graph elements into the set of numbers (usually positive integers), called labels. In this presentation, we discuss some results about the odd graceful labeling of the certain family of graphs known by w-trees. In addition, the results on the union of w-trees with the other families of graphs are also presented.

Characterization of the minimizing graph in the certain families of graphs

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The adjacency matrix $A(G) = [a_{(i,j)}]$ of the graph G is a matrix of order n , where $a_{(i,j)} = 1$ if v_i is adjacent to v_j and $a_{(i,j)} = 0$ otherwise. In a certain class of graphs, a graph is called minimizing if the least eigenvalue of its adjacency matrix attains the minimum. In this presentation, we characterize the minimizing graph among the various families of graphs whose complements are connected.

Application of Sanchez's approach to disease identification using trapezoidal fuzzy numbers

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In this talk we will present an integrated approach of mathematical techniques and various aspects of the medical diagnosis, which aims to provide an effective tool in the field of therapeutics. Sanchez technique based on fuzzy soft set theory has been developed and employed to simplify the disease diagnosis procedure. In the end, to get more insight of the developed approach, an elaborative example assuming hypothetical data has also been presented.

Impact of water hardness in instinctive laundry system based on fuzzy logic controller.

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In this paper, we discuss the effects of water types and temperature in automatic washing machine. The automatic washing machines are being used in hard water areas deprived of useful results because machines could not detect the type of water. Hard water consumes more detergent and washing time for laundry. The proposition of the paper is that the soft water and high temperature should be used in washing machines, it will not only reduce the quantity of detergent but also have positive effects on economy and fabrics. In this way, energy and washing time can be saved. The results are varied by TOPSIS technique of MCDM. The pretending results and the actions of the aforesaid device have been done by using MATLABs fuzzy logic toolbox.

Hard X-Rays Emission from Laser Induced Plasma

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The hard X-rays of Nd: YAG laser (1064 nm, 9-14 ns, 1.1 MW) induced Aluminium Antimonide plasma has been investigated. With laser intensity $\sim 10^{15}$ W/cm², Aluminium Antimonide target was irradiated at tight focus for the emission of hard X-rays under vacuum $\sim 10^{-3}$ torr and in air. The emitted hard X-rays were monitored by a Photo Multiplier Tube (X-ray detector) and filtered by using Al filter of 10 $\hat{\text{A}}$ thickness. The basic phenomenon which is considered for hard X-rays discharge from laser induced Aluminium Antimonide plasma is being elaborated. Confinement of plasma takes place at huge pressure. The evaluations are also augmented by the time resolved transitional conduct of hard X-rays. Various specifications of hard X-rays discharge with variable pressures are being calculated. Current, Voltage and energy of hard X-rays are inversely proportional to the ambient pressure and are directly proportional to the count of laser shots.

Simultaneous nutrients removal from agricultural runoff and biogas production from microalgae

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With increase in population and food demand the agricultural practices have become more dependent on utilization of chemical fertilizers. Although application of these fertilizers has resulted in considerable increase in food crops yield, but also have the serious environmental consequences. The excessive nutrients either leach in the soil or through agricultural runoff cause eutrophication in water reservoirs. This eutrophication disturbs the aquatic life. To overcome problems related to the environment as well as to save aquatic life microalgae is considered as potential candidate for biotreatment. Microalgae have ability to utilize excessive nutrients from agricultural run-off and the produced biomass can be used to produce biogas. Selected macroalgal strain was cultivated in agricultural runoff for nutrients removal and biomass produced was utilized for biogas production through anaerobic digestion. Comparison was made in biogas production from whole biomass of microalgae and the oil extracted biomass. Biomass productivity of selected strain was 0.29g L⁻¹day⁻¹ while Reduction of nitrate and phosphate in agricultural runoff was about 95% and 91% respectively. Biogas yield was high 580 Nml g⁻¹VS in case of residues left after lipid extraction as compare to whole biomass that was 566Nml g⁻¹VS. From the results we can conclude that the microalgae not only reduces the nutrients in agricultural runoff but also have the potential to produce biogas.

Effect of thin film thickness and pH on the growth and Electrical properties of ZnONanorods for energy storage devices

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Electrical properties and nanostructures play the fundamental role to improve electrical performance of materials for energy storage applications. ZnO nanorods were fabricated on the pre-deposited ZnO thin film on glass substrate by using the hydrothermal technique at various pH values. The samples were studied by using the X-ray Diffraction (XRD), Scanning electron microscopy (SEM), and four probe method for resistivity measurement. The XRD analysis confirmed the wurtzite hexagonal structure of ZnO nanorods. The measured crystallite size was 19.0530, 21.1122 and 12.4876 nm at pH of 9.25, 9.75 and 10.50, respectively. The SEM images showed the flower shaped ZnO nanorods. The length of ZnO nanorods was observed as 785, 700 and 1225 nm at pH of 9.25, 9.75 and 10.5, while diameter vary from 450 to 285 nm, respectively. Electrical resistivity strongly depend upon the length of nanorods.

High Specific Capacitance and Energy density of Synthesized Graphene Oxide based Hierarchical Al₂S₃ Nanorod and SrS Nanorods for Supercapacitor Applications

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High specific surface area and electrical conductivity of nanostructure metallic Sulfides are very fundamental to attain high specific capacitance, energy density and power density of an electrode material for supercapacitor applications. Graphene oxide (GO) supported hierarchical Al₂S₃ nanorod and SrS nanorods like morphology have been fabricated by employing hydrothermal method. The determined high electrical conductivity, surface area, as well as the mechanical support offered by GO makes the Al₂S₃ nanorod and SrS nanorod electrochemically active. The CV curves with well-defined redox peaks confirm the pseudocapacitive behavior of GO based hierarchical Al₂S₃ nanorod in 1 M NaOH electrolyte and GO based SrS nanorods in 2 M KOH electrolyte. The specific capacitance extracted from the GCD profile is 2178.16 Fg⁻¹ for GO based Al₂S₃ nanorod and 1831.14 Fg⁻¹ for GO based SrS nanorods at the current density of 3 mA cm⁻². The energy density calculated from the galvanostatic discharge is 108.91 and 91.56 WhKg⁻¹ for GO based hierarchical

Al_2S_3 nanorambutan and SrSnanorods at the current density of 3 mA cm^{-2} . The electrochemical impedance also confirms the pseudocapacitive nature of Al_2S_3 hierarchical nanorambutan and SrSnanorodselectrode materials. The experimental results suggest that hierarchical Al_2S_3 nanorambutan is more suitable electrode material for supercapacitor applications.

Degradation Mechanisms and Effect of γ -Radiation on Nickel Metal Hydride (NiMH) Rechargeable Batteries

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Rechargeable batteries having high tolerance to radiation environments are critical to space exploration missions. This paper explores the observable effects of induced gamma radiation on nickel-metal hydride (NiMH) rechargeable batteries. NiMH rechargeable electrochemical cells were exposed to gamma irradiation at a dose up to 20 Mrad. Battery charge and discharge characteristics were monitored and recorded before and after the radiation. In order to monitor the tolerance of these cells at different levels of intensities of radiations, a wide range of experimental method was developed and used to study the degradation mechanism. The observed characteristics indicate the output voltage efficiency of battery cells degraded before and after irradiation at room temperature for the dose values 4 Mrad, 10 Mrad, 16 Mrad and 20 Mrad radiations. The observed results after irradiation indicate degradation in output voltage as the radiation intensity increases. Post-radiation cycling tests also indicate that these cells performance degraded significantly as their cyclability subsequent to radiation exposure.

Physics in Medicine and Biology-An over view

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Physics is the most fundamental and vital spotlight of natural sciences for covering nearly all aspects of physical world. Its role in the diagnosis and treatment of diseases needs to be

discussed for the scholars and researchers in this field. An overview is being presented here to explore the applications of physics in medicine and biology with a hope that this can be helpful for the students struggling to find the areas of their research especially for their M.Phil. and Ph.D. proposals for admissions in national and international universities. Latest diagnostic tools and treatment techniques are presented briefly.

SHIFTING OF MAGNETIC EASY AXIS OF NICKEL NANOWIRES BY VARYING DIAMETER

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Anodized aluminum oxide (AAO) templates with an average diameter of $D_1 = 20\text{nm}$ and $D_2 = 200\text{nm}$ are synthesized by two-step anodization. Nickel nanowires are fabricated by AC electro deposition with less microstructure defects at low voltage in AAO templates. Magnetic properties of compact nickel (Ni) nanowires show that easy axis is parallel to nanowire axis for diameter $D_1 = 20\text{nm}$ while by varying diameter from $D_1 = 20\text{nm}$ to $D_2 = 200\text{nm}$, easy axis shifts to perpendicular direction of nanowire axis. This shifting of magnetic easy axis from parallel to perpendicular direction is mainly due to shape anisotropy and interactive fields between the wires. The competition between shape anisotropy (due to individual wire) and interactive fields by varying diameter of nanowires could result in tailoring of the direction of magnetic easy axis of nanowires.

Lead Acid Battery efficiency enhancement factors

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Abstract: Lead-acid batteries are the most versatile and reliable power source among all the rechargeable battery system but the present performance of lead-acid batteries are not adequate for emerging applications. Battery performance and market demand is dependent on its fundamental chemistry with respect to sizes and applications. Efficiency of a lead-acid battery changes ominously when we add only little amount of additives to cathode, anode and electrolyte. Additives like inorganic acids and salts, organic, carbon and polymer emulsions, binary or mixed additives, etc. ominously effects the electrochemistry of a lead-acid cell. Selection of additives have been easy both by inhibitor and expander action. When added to the electrolyte or to PAM and NAM, numerous phenomena can be detected which are related with the additives action in the cell. There has been tremendous developments for the steady improvements in the efficiency, durability, lifetime, dependence, performance, specific energy, charge/discharge process, rechargeability, crystallization process, reduction in water loss, prevention of hard sulfate formation, reduction in PAM detaching, decrease in corrosion of anode made of lead, during charging Pb (IV) compounds formation, etc. Depending on the nature of the additives used, any of the above mentioned factors can be effective. dCNTs, ILs, H₂O₂ and some mixed additives are found to be more suitable than other additives because some of them have environment friendly nature, advantageous physical and chemical properties. This paper also include calculations of active materials for lead-acid cells using basic units and applications of diffraction techniques (XRD, S-XRD, neutron and electron diffraction techniques) to study lead-acid battery performance and crystallinity, abundance, amorphous material, plate capacity, cycle life retained by plates, size, shape, surface area, amorphous content (between 10 wt.% to 29 wt.%), polymorphs size, porosity and particle size of PAM and NAM.

.Identification of electronic quantum coherence and entanglement between the excited states of different pigments in the light harvesting stage of photosynthesis

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Organisms that undergo photosynthesis initially absorb light energy through the process of electron excitation in an antenna. However, this electron excitation must be transferred in an efficient and timely manner, before that energy is lost in fluorescence. Various structures are responsible for transferring energy from the antennas to a reaction site. This electron excitation creates a separation of in a reaction site that is latter converted into chemical energy for the cell to use. Bacteria can use ring like structures as antennas, where plants and other organisms use chlorophyll pigments to absorb photons. Studies published in 2010 claimed to identify electronic quantum coherence and entanglement between the excited states of different pigments in the light harvesting stage of photosynthesis. However, critical follow up studies questions the interpretation of these results and assign the reported signatures of electronic quantum coherence to nuclear dynamics in the chromophores. There are a number of proposals as to how quantum coherence transfers the absorbed energy to the reaction site. One of the best studied is the FMO complex in green sulfur bacteria.

SYNTHESIS AND SPECTRAL CHARACTERIZATION OF CARBOXYLATE LIGAND, DERIVED FROM 2,4 DINITROPHENYLHYDRAZINE

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This research is based on the synthesis of carboxylate base ligand derived from various amines, aromatic compounds. The ligand is prepared by reacting maleic anhydride and p-Toluidine which gave us a light brown initial color and light yellow end product after continuous stirring on magnet stirrer overnight. That have very high melting point and is soluble in organic solvents. Its physical and chemical properties have been investigated by using different solvents like ethyl

acetate, acetone, methanol, ethanol, chloroform, n-hexane, DMSO, distilled water, glacial acetic acid. After obtaining the product the %age yield of the product was calculated and characterized by using FTIR. This ligand can be used in many applications such as anti fungal, anti-bacterial antimicrobial activities. It can also be used in the synthesis different metal complexes.

Synthesis, Spectral Characterization and Photocatalytic Applications of Sulfur-doped Graphitic Carbon Nitride Nanocomposite with Silver-doped Zinc Oxide

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In this study, ZnO nanoparticles as well as silver-doped zinc oxide nanoparticles were prepared by co-precipitation method by varying the amount of silver (3, 5, 7 and 10 wt %) of silver nitrate. Furthermore, these nanoparticles were made composite with sulfur-doped graphitic carbon nitride (g-C₃N₄). Each sample was characterized by XRD, FTIR, SEM, TEM and XPS techniques to find out its morphology. The photocatalytic activity of the samples was testified via photodegradation of methylene blue (MB) as a standard dye. For this purpose, the concentration of MB used was taken to be 2.8x10⁻⁶ M. The quantity of photocatalyst sample used was 0.05 grams. It was observed that the composite of sulfur-doped g-C₃N₄ with silver-doped ZnO show much enhanced photocatalytic performance as compared to any other sample acting as alone.

Evaluation of antibacterial potential of Melia azedarach Linn

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Evaluation of antibacterial potential of *Melia azedarach* L. Abstract: Medicinal plants are a key source of raw material for the conventional system like Ayurveda, Unani and Siddha. *Melia azedarach* (*M. azedarach*) L. is most versatile medicinal plants of meliaceae family which have great interest for scholars. Plant contains many compounds including, terpenoids, saponins, glycosides, alkaloids, rutins, flavonoids and phenolic compounds. These bioactive constituents are antibacterial, anti malarial, analgesic, anticancer, and antiviral. In Pakistan infectious diseases are major cause of deaths. With passage of time microorganisms has developed resistance to approximately all the antibiotics. Several antibiotics have severe side effects which reduce their applications. There is a need to build up such antimicrobial resources with extra efficacy and least side effects. It is reported that *M. azedarach* is a probable source of innovative antibiotics. The bio active compounds are economical, less toxic and potentially effective. Crushed leaves of plant were extracted with methanol. The extracts showed excellent antibacterial activity against three strains *Escherichia coli*, *Bacillus thuringiensis* and *Staphylococcus aureus*. The maximum inhibition zone diameter showed the highest activity of methanol extract and is obtained for *Staphylococcus aureus*, *Escherichia coli* and *Bacillus thuringiensis*. The results indicate that methanolic extracts of leaves of *M. azedarach* L. could be a successful source of herbal treatment against infections.

Soft Zorn's Lemma

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The present work is about Zorn's Lemma, soft sets and soft matrices. The research shows that set of soft sets and soft matrices over the same universal set obey Zorn's lemma.

Binomial edge ideals of graphs

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In this talk, we will study binomial edge ideals, some of its combinatorial and algebraic properties. We will study algebraic invariants like primary decomposition, krull dimension, depth, Hilbert series, Castelnuovo-Mumford regularity and minimal free resolution of binomial edge ideals of some nice classes of graphs. We will also discuss the sequentially Cohen-Macaulay property of binomial edge ideals.

Fuzzy Parameterized Fuzzy Soft Metric spaces

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Starting with the knowledge of fuzzy parameterized fuzzy soft point (fpfs-point) in fpfs-sets, we introduce the notion of fpfs-metric space. We investigate some topological structures of fpfs-metric space including fpfs-open ball, fpfs-closed ball, fpfs-diameter and fpfs-neighborhood of fpfs-set. We inaugurate some motivating results based on fpfs-metric space. To handle the decision-making problem we construct an algorithm and present a novel application for fpfs-metric space.

Some Properties of FPFS-Compact Spaces

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In this paper, we present fuzzy parameterized fuzzy soft set (*fpfs* -set) and *fpfs* -topology. We define *fpfs*-neighborhood germ, *fpfs* - S -neighborhood and dual *fpfs* -point. We introduce various concepts including support of *apfs* -set and *fpfs* - Ω -accumulation point, finite intersection

property, *fpfs* mappings, *fpfs* -homeomorphism and *fpfs* -compact space. We establish an algorithm for *fpfs* -compact topological space to the decision-making problem.

Application of Sanchez's approach to disease identification using trapezoidal fuzzy numbers

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In this talk we will present an integrated approach of mathematical techniques and various aspects of the medical diagnosis, which aims to provide an effective tool in the field of therapeutics. Sanchez technique based on fuzzy soft set theory has been developed and employed to simplify the disease diagnosis procedure. In the end, to get more insight of the developed approach, an elaborative example assuming hypothetical data has also been presented.

THEFT-GANG OPTIMIZATION ALGORITHM: A NOVEL POPULATION BASED META-HEURISTIC FOR UNCONSTRAINED OPTIMIZATION

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A novel meta-heuristic known as Theft-gang Optimization Algorithm (TOA) is presented in this paper. The proposed method is based on the greedy and criminal behavior of thieves which store their expensive objects in hiding places and retrieve it when the objects are needed. The developed method is applied to 26 benchmarking test functions and quality solutions are obtained. The results obtained by TOA are compared with the results of various algorithms like

Genetic Algorithm, Differential Evolution, Particle Swarm Optimization, Bees Algorithm and Particle Bee Algorithm. Simulation results reveal that using TOA may lead to finding promising results compared to the other algorithms.

Stellar Zoo, Past and Future Abstract:

Dr. Zeeshan Yousaf

This talk is devoted to explore the unstable/stable regimes of self-gravitating matter configuration of spherical star due to the impact of modification in gravity. The system is designed by keeping the system in hydrostatic equilibrium initially and then moved into the nonstatic phase. After performing perturbation approach, I found that the extra curvature invariants of modified gravity has greatly modified collapse rate due to their repulsive nature.

Evolution of Celestial Objects in Modified Gravity

Dr. M. Zaem-ul-Haq Bhatti

In this talk, I will discuss the evolutionary process of self-gravitating celestial objects in the background of modified gravity. I will start from inflationary period and discuss the current cosmic epoch of dark energy. Some irregularity constraints would be presented which are obtained for different celestial objects. At the end I will conclude the whole discussion.

Strong Meson Decays and QCD

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Some models of the strong meson decays are introduced, along with the phenomenology based on them. The emphasis is on charmonia decays. Models include the 3P0 model, the flux tube model and the effective Lagrangian approach. In an effort to link them to QCD, some lattice

QCD results for the string breaking, underlying strong meson decays, are described, along with the Bethe Salpeter equation for decays of pseudoscalar mesons.

THIN SOLID FILM FORMATION BY PHYSICAL VAPOUR DEPOSITION (PVD):

Problems faced and their remedies

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The field of thin films can be defined as the confluence of materials science, surface science, and applied physics, has become an identifiable unified discipline of scientific endeavor. Applications of thin films are in a wide variety of areas, such as electronics, optics, optoelectronics, metallurgical protective and hard coatings, magnetic and magneto-optics, superconductivity, sensors and actuators, and biological and related Films. Methods of thin film formations are PVD (resistive heating, electron beam heating and sputtering), chemical vapour deposition (CVD), spray coating, dip coating, spin coating, pulsed laser deposition (PLD). PVD is by far the most widely used method.

Some of the problems faced with PVD are for example dissociation of compounds (leading to films that may be non-stoichiometric), different rate of evaporation, in case of compound materials may lead to non-stoichiometric films, and reaction of the evaporant with boat material may lead to impure film. Identification and remedies for such problems will be discussed with specific examples.

Hawking Radiation as Particles Tunneling

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On the basis of quantum theory, Hawking analyzed an important aspect that black hole emits particles through their horizon, having central role in standard model. We have investigated some significant characteristics of Hawking's spectrum of radiation. The tunneling phenomenon is studied for fermions/vector particles (charged massive) by applying semi-classical approximation to the suitable background wave equation. Moreover, the tunneling probabilities and their corresponding Hawking temperatures for outgoing particles are also evaluated.

Edge metric dimension of graphs

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The edge metric dimension of a graph is introduced based on the distance of edges of the graph. As a main result we computed edge metric dimension of n -sunlet graph and prism graph which turnout to be a constant.

Solution to nonlinear functional equations involving Suzuki type generalized multivalued mappings in fuzzy metric spaces with applications in dynamic programming

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The aim of this presentation a class of multivalued Suzuki type generalized contractive mapping in fuzzy metric spaces is introduced and some fixed, coincidence and common fixed point theorems are obtained. Some examples are presented here to support the results proved herein. As an application, the existence and uniqueness of common bounded solution of functional equations arising in dynamic programming are obtained. Our results generalize and extend various results in the existing literature.

Poster Presentations

Structural and Electrical Properties of Gadolinium Doped Bismuth Telluride

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Thermoelectrics is a prominent technology in renewable energy sources. Thermoelectric materials convert heat energy into electrical energy and develop pollution free and cost effective form of energy conversion. Thermoelectric materials provide an alternative for refrigeration and power generation. The performance of thermoelectric devices depends on the properties of materials i.e. Seebeck coefficient, electrical conductivity, thermal conductivity and thermal stability. Thermoelectric materials include tellurides, cobaltites and oxides. Bismuth telluride is the most important material as Bi_2Te_3 has crystalline structure and is highly anisotropic in nature. Structural properties of the materials can be enhanced by adding a very small amount of rare earth element. In this work, bismuth telluride doped with rare earth element i.e. Gadolinium of different compositions i.e. 0.0 and 0.05 is synthesized by using the simplified sol-gel method. X-ray diffraction (XRD) is used to analyze the structural parameters i.e. phase purity, crystal structure, crystallite size and lattice parameters of the samples. The results showed the rhombohedral structure of Bi_2Te_3 and phase purity was achieved. AC electrical properties i.e. AC conductivity, loss factor, dielectric constant and impedance as a function of frequency were done. AC conductivity increased with the increase in frequency while the loss factor, dielectric constant and impedance decreased with the increase in frequency.

Conductivity Enhancement in Ceria-based Composite Electrolyte for IT-SOFC

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Green energy is renewable and of great importance because of being sustainable and environment friendly. Fuel cell (FC) is considered a key solution of providing clean efficient production of energy. It has a wide range of applications in military projects, transportation and automotive market. A fuel cell is a device that generates electrical energy by a chemical reaction. It has three components i.e. anode, cathode and the electrolyte. Electrolyte plays an important role in determining the efficiency and working temperature of the fuel cell. Fuel cell, on the basis of electrolyte, is classified as Alkaline fuel cell (AFC), Molten carbonate fuel cell (MCFC), Phosphoric acid fuel cell (PAFC), Polymer electrolyte membrane fuel cell (PEMFC) and Solid oxide fuel cell (SOFC). SOFC uses a solid ionic conductor as an electrolyte and has wide applications due to its high power density, durability and environment friendly nature. Doped ceria have shown greater ionic conductivity due to generation of oxygen vacancies. Gadolinium and Neodymium were chosen as dopants for ceria. The composite electrolyte consisting of Gadolinium and Neodymium as matrix phase and Lithium Sodium sulphate as the second phase was investigated as an electrolyte for SOFC. The composition chosen for Cerium Gadolinium Neodymium oxide (CGN) is $Ce_{0.5}Gd_{0.25}Nd_{0.25}O_{2-d}$. The composition chosen for lithium sodium sulphate $[(Li_{1-x}Na_x)_2SO_4]$ is $(Li_{0.9}Na_{0.1})_2SO_4$. The composite proportion will be $[Ce_{0.5}Gd_{0.25}Nd_{0.25}O_d]_{0.8} / [(Li_{0.9}Na_{0.1})_2SO_4]_{0.2}$. Structural analysis, of CGN and lithium sodium sulphate separately and for the composite, was done using XRD technique. Structural analysis revealed cubic structure of CGN and hexagonal structure of lithium sodium sulphate. DC analysis was done using two probe method. LCR meter was used to measure the capacitance and dissipation factor at different temperatures (up to $600\text{Å}^\circ\text{C}$) for frequency ranging from 20 Hz to 3MHz. Then using dielectric loss ($\tan\delta$) and dielectric constant (ϵ'), AC conductivity (σ_{ac}) was calculated at different temperatures. The composite showed higher ionic conductivity than the CGN compound.

Study of Structural and Electrical properties of M-type hexaferrites

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Hexaferrites have gained a great importance in nanotechnology. Ferrites are preferred due to their high electrical resistivity and good chemical stability. Higher resistivity is required to control the energy losses for better performance. Magnetoplumbite ferrites crystallize in hexagonal structure and are also known as hard ferrites. Gadolinium doped hexaferrites samples, with composition $Ba_{0.25}Sr_{0.75}Fe_{12-x}Gd_xO_{19}$ ($x=0.0, 0.2$) have been prepared by without water and surfactants sol-gel (WOWS) method. For structural properties x-ray diffraction (XRD) was used. The formation of hexagonal structure has been confirmed from XRD, when sintered at $920^{\circ}C$ for 20 minutes. AC electrical properties such as AC conductivity (σ_{ac}), dielectric constant (ϵ'), dielectric loss tangent ($\tan\delta$) and impedance (Z); real (Z') and imaginary (Z'') parts were analyzed at room temperature. Study of AC electrical properties reveals higher resistance. Both dielectric constant and loss tangent decreased with increasing frequency. This work was focused on investigating electrical properties and is correlated with structural properties.

Synthesis, Structural and Electrical Properties of Nickel-Iron Oxide Nanoparticles for Gas Sensing Applications

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Nickel-iron oxides nanoparticles have a wide range of applications such as gas sensor, nanodevices, energy conversion devices and in biotechnology. They show better results than other mixed metal oxides, especially as gas sensors. In this work, a comparison of structural and electrical properties of γ - Fe_2O_3 and $(NiO)_x(Fe_2O_3)_{1-x}$ ($x = 0.25$) was studied. The samples were synthesized by without water and surfactant (WOWS) sol-gel method. The synthesized samples

were sintered at 550^oC for 1 hour. X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR) were used for structural analysis of the samples. XRD confirmed rhombohedral phase for γ -Fe₂O₃ and cubic phase for sample x=0.25. Surface morphology of both samples was studied by using scanning electron microscopy (SEM). To study electrical properties, dc conductivity of samples was measured as a function of temperature ranges (30o C-425o C). For Ac electrical properties, dielectric loss tangent (tan d), dielectric constant (ϵ') and ac electrical conductivity (σ_{ac}) were measured as a function of frequency (20Hz-3MHz) and as a function of temperature at fixed frequency. Ac electrical properties were studied by using Maxwell's-Wagner model. Comparison of structural and electrical properties of the prepared samples were done. The nickel-iron oxide showed better conductivity and can be used in gas sensing devices.

Production of Thermo-electric Power from Municipal Solid Waste: A Techno-Economic Study of Kasur City, Punjab, Pakistan

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This techno-economic study reports the feasibility of generating thermoelectric power from municipal solid waste (MSW) of Kasur City by incineration process. The gathered data was processed to design different alternative projects for installation of a thermal power plant in the city of Kasur. Discounted cash flow technique was used to evaluate alternative projects so that their Benefit to Cost Ratio, Net Present Value, Internal Rate of Return and Payback Period can be determined. The study revealed that Kasur City currently consumes 18MWh electricity and generates 179 tons/day MSW. The generated waste has the ability to produce 2.1MWh electricity at the cost of USD 0.0581/unit with an expenditure of USD 3,907,692 as initial fixed investment of forming about 1/7th of consumption of Kasur. The cost from this source, when compared to current rate of electricity in Pakistan (USD 0.1346), is roughly half.

Determination of thiabendazole in fruits and vegetables

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Pesticides are important source of diffuse pollutants that are the major cause of environmental and food contamination, as well as health risk for living organisms. Therefore there is a necessity of simple, fast and cost effective methods for the quantitative determination of pesticides in both environment and food samples. The presented research was carried out a method for the analysis of residual of thiabendazole in fruits and vegetables by HPLC and UV spectrophotometer. The procedure was based on the solvent extraction by adding acetonitrile in the sample. To remove the moisture of the sample used sodium chloride as a moisturizing removal. Then purification was carried out microfiltration and purified samples were analyzed by HPLC. Under the selected conditions, the detection limit of thiabendazole was 0.003 mg/kg. Tests for recovery were carried out by addition of three concentration standard solution of thiabendaole (0.1, 0.5 and 1.0 mg\kg) to the blank sample. The mean recovery rate of thiabendazole was 80% ~ 95.0%. The sensitivity, accuracy and precision of this method were able to meet the requirements for pesticides residue analysis.

ESTIMATION OF BLENDS OF CANDELILLA WAX AND PLANT EXTRACTS FOR FRUIT STORAGE

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Now a days there is high demand for healthier and fresh food consumption by society. In recent years, naturally occurring substances has been mainly focused to process fruits and vegetable being as alternative antioxidants and antimicrobials. Blending of plant extracts of medicinal plants with Candelilla wax used for edible coating has been experimented by different

researchers. In this study two medicinal plants are selected who are known to have antifungal potential. Cassia Fistula (*C. fistula*) commonly known as Amaltash phal is one of most versatile medicinal plant of Fabaceae family which have great attraction for scholars. Studies showed the presence of antifungal activity present in leaves extracts. These compounds reported pharmacological effects like antimicrobial, antioxidant, anti-inflammatory, hepaprotective and hypoglycemic potential. The powdered leaves of *C. fistula* were extracted in Soxhlet extractor with methanol. *Achyrenthes aspera* (*A. aspera*) belongs to the Amaranthaceae family. The plant are used to cure antirhematic, diuretic, dental pain or menstrual discomfort. Studies reveals that antifungal properties are depicted in plant leaves extracts. The well knowns ingredients which were isolated from this plant are flavones derivatives (astragalin, isoquercetin), phenolic acids, sterols, quinones, polysaccharides, saponines. The powdered leaves of (*A. aspera*) were extracted with methanol. This study will be useful to explore the application of blended wax to prolong the freshness of fruit on industrial scale.

Synthesis, Characterization and Photocatalytic Applications of P(AAc) Microgels and its Composites of Ag Doped CuO Nanoparticles

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CuO and Ag doped CuO nanoparticles were synthesized through co-precipitation method. Copper sulphate pentahydrate was used as Cu precursor to synthesized CuO nanoparticles. Microgels was synthesized through poly(Acrylic acid)-co-MBA in organic solvent and nitrogen atmosphere. Photocatalytic activity of Ag doped CuO and Ag doped CuO nanoparticles composite with microgels were studied. XRD technique was used to verify the size of CuO and Ag doped CuO nanoparticles. TEM, SEM and DLS techniques were also used to study the structure and morphology of the CuO nanoparticles, Ag doped CuO nanoparticles and microgels. FTIR technique was used to determine the functional group and impurities in sample. UV-Vis spectroscopy was used to measure the photocatalytic study of the composite. Photocatalytic activity of the synthesized nanomaterials was successfully tested for photodegradation of

methylene blue as model pollutant. The photocatalytic activity results confirm that the synthesized composite photocatalyst show higher activity than the individual particles.

Synthesis, Characterization and Photocatalytic Application of p(AAc) Microgels and its Composites of Ni Doped ZnO Nanoparticles

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Abstract ZnO nanoparticles and Ni doped ZnO nanoparticles with different concentration of $(\text{Zn}_{1-x}\text{Ni}_x\text{O})$ ($X = 0.01, 0.03, 0.06, 0.09$) were prepared by co-precipitation method by using zinc acetate dehydrate and nickel nitrate as zinc and nickel precursor while PVP as a surfactant, in presence of NaOH was used. p(AAc) microgels and its composites of Ni doped ZnO nanoparticles were synthesized by inverse phase polymerization method under N_2 gas atmosphere. Optical structure and morphology of microgels and its composite were determined by XRD, AFM, TEM, SEM, EDS and UV-Visible spectrometer. The photocatalytic activity of the samples was testified by using Tungsten lamp of 500 W via photodegradation of methylene blue (MB) as a standard dye. It was observed that the composite of p(AAc) microgels with Ni doped ZnO nanoparticles show much enhanced photocatalytic performance as compared to any other individual particle acting as alone. The enhanced photocatalytic activity is due to enhanced surface area, surface roughness and decreasing band gap.

Synthesis characterization and photocatalytic applications of pAAc microgel and its composites with Cu doped ZnO nanoparticles

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Hybrid polymeric microgels have attained great attention because of their enhanced photocatalytic activity. In this study Cu doped ZnO nanoparticles were synthesized by using coprecipitation method by varying compositions (5%, 10%, 15%, 20% and 25% by wt.). The poly(Acrylic acid)-co-MBA microgel synthesis was carried out in organic solvent under Nitrogen environment. Then, composites of p(AAc)-co-MBA with Cu doped ZnO nanoparticles were prepared. The size of the nanoparticles was determined using XRD. The structure and morphology of the nanoparticles was verified using SEM, TEM and DLS techniques. The functional groups and impurities in the nanoparticles were characterized using FTIR. UV-Visible spectroscopy was used to study the photocatalytic activity of composite against methylene blue as standard dye. UV-Visible spectroscopy confirmed the enhanced photocatalytic activity of p(AAc)-co-MBA microgel composites because of reduced band-gap of ZnO with Cu doping.

PHYTOCHEMICALS FROM THE SEEDS OF PEGANUM HARMALA AND THEIR ANTIOXIDANT AND ANTIBACTERIAL ACTIVITY

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This research evaluated the phytochemical analysis, in vitro antioxidant activity and antibacterial activity of P. harmala seed extracts against different polarity solvents. Extraction is done by solvent extraction method. Preliminary qualitative phytochemical study showed the presence of secondary metabolites alkaloids, steroids, terpenoids, saponins and glycosides in different extracts of P. harmala seeds while in methanol extract glycosides was absent. Tannins were

absent in all extract of *P. harmala* seeds. Total phenolic content was determined by Spectrophotometry by using Folin-Ciocalteu reagent. Antioxidant activity of different extracts of plant seed was checked by using DPPH radical method and ascorbic acid as standard. Dichloromethane extract of plant seed was found to have strong antioxidant activity of 85.4% while the % inhibition of ascorbic acid was 92%. Antibacterial activity of plant seeds extracts was also tested by disc diffusion method against three bacterial strains comprising *Staphylococcus aureus*, *Bacillus subtilis* and *Salmonella typhimurium*. Chloroform, dichloromethane and benzene extract showed mild antibacterial activity against *S. typhimurium* while methanol extract showed antibacterial activity against *Staphylococcus aureus*. Hexane extract failed to inhibit the growth of bacteria. The result have shown that *Peganum harmala* Linn is rich source of secondary metabolites, a strong antioxidant and possess mild antibacterial activity.

Synthesis, Characterization and Photocatalytic Applications of S-Doped Graphitic Carbon Nitride Nanocomposites with Nickel Doped Zinc Oxide Nanoparticles

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Synthesis, Characterization and Photocatalytic Applications of S-Doped Graphitic Carbon Nitride Nanocomposites with Nickel Doped Zinc Oxide Nanoparticles. Durrayshahwar*1; Mohsin Javed1 Department of Chemistry, School of Science, University of Management and Technology, Lahore *Corresponding author: S2016140011@umt.edu.pk Abstract: Coprecipitation method was adopted for the synthesis of Ni-doped zinc oxide nanorods. S-doped graphitic carbon nitride was obtained by calcination of thiourea. After that, composites were formed with different concentrations. Photocatalytic activity for the degradation of dye (methylene blue) was investigated by composites ethanol was used as a solvent. The characterisation was performed by XRD, SCM, FTIR and optical properties were investigated by UV visible spectrophotometer concentration levels have great impact on the degradation of dye.

Synthesis, Characterizations and photocatalytic activity of Sulphur doped Zinc Oxide and its composite with graphene oxide for dye degradation

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Environmental pollutants such as organic dyes, are of major focal areas of current era. For this reason, excellent photocatalytic substances are the need of time to degrade such water bodies and get pollution free water. Zinc oxide-graphene based composites are of great interest in this regard being economical, high reactive and eco-friendly. In the present study, sulphur doped zinc oxide nano particles are prepared by using eco-friendly solution free method and graphene oxide is synthesized by modified hummer's method. Sulphur doped zinc oxide nanoparticles are combined with graphene oxide in five different weight percentages to obtain the various concentrations of dopant in composite. The photocatalytic composite is characterized by using the techniques viz. FTIR, UV spectrophotometry, SEM, TEM to find out its morphological features. Photocatalytic activity of the composite is determined by using the methylene blue as a standard pollutant. The newly formed composite showed the enhanced photocatalytic activity than that of individual nanoparticles and graphene oxide. Effect of concentration of dopant in composite, initial concentration of methylene blue, photocatalyst loading, initial pH of the suspension and the irradiation time for dye degradation have also been investigated.

Antifungal and Antibacterial activity of *Achyranthes Aspera*

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There are many plants reported in history which are used to cure various human health diseases. Herbal medicines occupy distinct position from the primitive period to present day. *Achyranthes*

Aspera L. (*A. aspera*) is one of these medicinal plants and almost all of its parts are used in traditional system of medicine. This plant is commonly known as "chaff-flower, or prickly chaff flower. *A. aspera* is used in the treatment of cancer, asthma, wound, hepatitis, malaria, fever, cough, diabetes, toothache etc. The aim of this study was to evaluate the antifungal and antibacterial activity of different extracts of seeds of *A. aspera*. The plant seeds were extracted with water, n-hexane and methanol extracts. Phytochemical test reveals that plant contains steroids, alkaloids, tannins, flavonoids, proteins, and saponins. The fungal strains used for the test were *Candida albicans* and *Aspergillus flavus*. The methanol extract of *A. aspera* showed significant antifungal activity against *A. flavus* than *C. albicans*. For antibacterial activity, *Staphylococcus aureus*, *Klebsiella* and *Escherichia coli* bacterial strains were used. The methanol extract showed higher antibacterial activity against *S. aureus* than other two bacteria. *A. aspera* hence considers one of the important medicinal plants.

Surfactant Assisted Synthesis of Noncrystalline ZnO & MnO Powders and their Bio-activities

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Zinc oxide and manganese oxide nanoparticles were synthesized by chemical method using poly ethylene glycol (PEG) as a surfactant, zinc sulphate ($\text{ZnSO}_4 \cdot 7 \text{H}_2\text{O}$) & manganese sulphate ($\text{MnSO}_4 \cdot \text{H}_2\text{O}$) as a precursor molecules. This is a simple and fast method for the preparation of ZnO & MnO nanoparticles with no need for expensive materials or complicated treatments. Different characterization techniques were used for the analysis of samples such as X-ray diffraction photometer (XRD), scanning electron microscopy (SEM), and Transmission electron microscopy (TEM). All the results confirmed that the surface of nanoparticles have sufficient compatibility with surfactant. These nanoparticles were tested for its antimicrobial activity against various bacterial and fungal pathogens. The nanoparticles were also used for the removal of toxic organic pollutants such as dye Acid Black 210 & Methylene Blue under UV irradiation. The different operational parameters such as the initial concentration of the dye,

weight of the photo catalyst, and pH on the photo catalytic degradation of the dye were investigated. Results proved that both nanoparticles can be used for removing organic pollutants. Antioxidant activity was done by DPPH method.

EVALUATION OF PLANT EXTRACT BASED CANDELILLA WAX FORMULATION TO IMPROVE SHELF LIFE OF FRUIT

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Most of fruits and vegetables ripe and become available in specific season only. Scientists have developed and adopted techniques to preserve seasonal foods for later use. Traditional Food preservation methods have been followed since times immemorial. Modern technology has been widely introduced in this field now. Blending of medicinal plant extracts with Candelilla wax applied edible coating has been experimented by different researchers. So significant study of two medicinal plants were explored of this purpose because of their reported antifungal activity. Aloe vera (*A. vera*) belongs to genus liliaceous. *A. vera* is commonly use in skin care and pharmaceutical products. Due to its antioxidant and antimicrobial properties *A. vera* would make a good choice in protecting and prolonging the shelf life of citrus fruits. Methanolic and aqueous extracts were used for this work. *Toona ciliata* (*T. ciliata*) is a large deciduous tree with a spreading crown. It is useful in, antiulcer, analgesic, antifungal activity. Some types of citrus fruits were selected for experiment. Results depicted a reasonable increase in shelf life of tested fruits therefore these two plant extracts can be used in place of synthetic preservatives for citrus fruits to keep them fresh.

Determination of antifungal activity of *Cymbopogon citratus*

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Medicinal are still a major part of traditional and herbal medicine in the developing countries. The use of medicinal plants is common among those people who have less or no access to prescribed. *Cymbopogon citratus* (*C.citratus*) is commonly known as "citronella grass" or "lemongrass" that belongs to family Gramineae (Poaceae). It is a perennial tropical grass with long, thin leaves. Lemon grass is found in folk remedy for coughs, consumption, malaria, pneumonia, bactericidal, fungicidal, antidepressant, antioxidant, analgesic, anti inflammatory actions and astringent properties. The aim of this study to evaluate the different the *C. citratus* extracts to inhibit the growth of fungi. Powdered leaves of *C. citratus* were extracted with n-hexane, water and methanol. The extracts showed significant antifungal activities. The antifungal activity of the citral and lemongrass leaves against yeasts was determined by using the agar diffusion method. In this work, the results showed that *C.citratus* is very effective against *Candida albicans* and *S.cerevisiae*. Results suggest that leaves of *C.citratus* can be a part of herbal medicines that can be used against fungal diseases.

Free Radical Scavenging Activity of *Verbena bonariensis*

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Verbena bonariensis (purpletop vervain) is a plant belongs to verbenaceae family. It is approximately 18 to 36 inch tall plant along with rigid branching stem having height 2 to 3 inch, purple colour flowers also observed on this plant in spring, summer and autumn season. It is used as a natural preservative rather than synthetic one. To ensure effectiveness, the antioxidant activity of n-hexane, chloroform, ethyl acetate, n-butanol, and aqueous fractions of said plant were prepared and evaluated by using five different methods i.e DPPH radical scavenging activity, total antioxidant study, ferric reducing antioxidant power analysis (FRAP), total phenolic contents and ferric thiocyanate (FTC) assay. Results revealed that ethyl acetate soluble fraction

expressed highest percentage inhibition of DPPH radical i.e $80.9 \pm 0.87\%$ inhibition at a concentration of $30 \mu\text{g/mL}$ as compared to other fractions. While FRAP analysis result indicated the highest antioxidant activity along with n-butanol fraction i.e $322 \pm 1.39 \text{ TE}/\mu\text{M}$, the other three methods effect indicated the highest antioxidant value against the ethyl acetate fractions. Hence, this research confirmed that *V. bonariensis* is a valuable plant, which is used in many natural preservatives also beneficial in preparation of many folk medicines due to its significant antioxidant results.

UTILIZATION OF THE WASTE COOKING OIL FOR MANUFACTURING SUSTAINABLE FUEL

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Biodiesel is a renewable diesel, fuel of domestic source it is obtained from fats and oils either by chemical or bio-chemical means. There are four methods in which oils and fats can be converted into biodiesel, namely, trans esterification, blending, micro emulsions and pyrolysis In this work biodiesel was manufactured from waste cooking oil by three steps method. Waste cooking oil was obtained from local restaurant of Lahore city of Pakistan. The acid value of used oil was 0.91. The first step was saponification, in which stoichiometric amount of NaOH was treated with oil. Second step was acidification in which soap solution is treated with stoichiometric amount of concentrated hydrochloric acid to produce free fatty acid. The last step was esterification, in which free fatty acid is reacted with methanol. All these reactions were performed at optimum temperature. The molar ratios of oil to methanol were 1:6. Hydrochloric acid was used as catalyst and its concentration was 5% of free fatty acid. The reaction yield was 74%. Finally several physical and chemical properties of biodiesel such as acid value, viscosity, specific gravity, pour point and flash point were examined.

Cuprous oxide nanoparticles as efficient antimicrobial agents

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Cuprous oxide nanoparticles were synthesized by using copper sulfate pentahydrate and hydrazine as reducing agent through a wet chemical method. XRD pattern confirmed the formation of crystalline cuprous oxide nanoparticles. Antibacterial efficiency of cuprous oxide nanoparticles was demonstrated against gram positive bacteria i.e. Pseudomonas, Klebsiella pneumonia and Streptococcus mutans and gram negative bacteria i.e. Escherichia.coli and Staphylococcus aureus. Amoxicillin was used as a standard antiseptic drug to compare the activity of cuprous oxide nanoparticles. Results showed that cuprous oxide nanoparticles are highly stable and showed maximum activity against Klebsiella pneumonia and minimum against Pseudomonas than standard antibiotic. Therefore, cuprous oxide nanoparticles are highly efficient and can be used to kill pathogens.

Synthesis and Characterization of Albendazole Nanoparticles and their Microbial Activities and Dissolution Rate

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The most of the drugs used as active pharmaceutical ingredients (APIs) have low water solubility are being used for many pharmaceutical applications that result in low bioavailability and therapeutic efficacy. To address this issue of drugs low solubility and hence low bioavailability the synthesis of drug nanoparticles is one of most recent research topics. The use of drugs nanoparticles in different pharmaceutical dosage forms has many advantages over use of conventional material in terms of greater bioavailability, efficacy, and very low side effects. In current study Albendazole nanoparticles were prepared by anti-solvent precipitation method. The

prepared nanoparticles were then characterized by XRD, FTIR, SEM and TEM. X-ray diffraction pattern of sample showed the amorphous form. The dissolution rate of the parent drug and API was determined using the dissolution test apparatus and the remarkable change in dissolution rate was observed. The FTIR spectra of API (parental drug) and prepared nanoparticles have similar bands and no major structural changes were detected. The SEM images showed that prepared nanoparticles of drug have nanosized particles. The antibacterial activities of API and prepared nanoparticles were determined against *Staphylococcus aureus*, *Bacillus subtilis* and *Escherichia coli* was by agar well diffusion method. The prepared nanoparticles showed better results as compared to parent drug API.

Combustion Synthesis, Characterization and Activities of CuO nanoparticles

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CuO nanoparticles were prepared by combustion synthesis method using *Trigonella foenum-graecum* (Fenugreek) plant extract. Cupric nitrate was dissolved in plant extract and stirred continuously for fifteen minutes by using magnetic stirrer. Small amount of sodium hydroxide solution was added drop wise under constant stirring. Precipitates of CuO was obtained within 2 to 3 minutes. Precipitates were filtered and washed 2 to 3 times in order to obtain pure nanoparticles. Obtained CuO nanoparticles were dried and annealed at 350°C temperature for half hour. Prepared nanoparticles were characterized using X-ray diffraction photometer (XRD), scanning electron microscopy (SEM) and Transmission electron microscopy (TEM). Obtained CuO nanoparticles were analyzed for their anti-bacterial, anti-oxidant and dye-degradation activities.

Exploration of adsorption capacity of low cost activated carbon for removal of copper ion from groundwater

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The ability of low cost activated carbon based on tamarind stone for the removal of copper ion from water was explored. Tamarind stone was converted into activated carbon by lean air carbonization and chemically activated by barium chloride. The factors affecting on adsorption process i.e particle size, concentration, and pH were investigated. The removal of copper ions from water was satisfactory.

Transition metal complexes of a bidentate Schiff Base derived by condensation of 2-aminothiophenol and 4-isopropylbenzaldehyde: synthesis, spectroscopic characterization and biological applications

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Novel Schiff base 2(4-isoprppyphenyl)benzo[d]thiazole derived from condensation of 4-isopropylbenzaldehyde and 2-aminothiophenol. The molar ratio of the reaction was 1:1. The metal complexes with VO(II), Cu(II) and Zn(II) have been prepared and characterized by X-ray crystallography, FT-IR spectroscopy and UV-visible. FT-IR data proved that (CH=N) of the azomethine stretching vibration is found in the ligand at 1620cm⁻¹. This band is shifted to lower wave number at 1605-1636cm⁻¹ in the complex indicating the participation of the azomethine nitrogen in coordination (M-N). UV-Visible spectral studies revealed that p-p* transitions were found in all compounds. The conductivity test of Schiff base and metal complexes showed they are non-electrolytic in nature. The XRD Data showed that ligand is triclinic in nature. Biological studies have shown that metal complexes inhibit ALP activity by attaching at the active sites of enzymes. The compounds also tested for in vitro antimicrobial screening which showed that metal complexes were more potent and active against bacterial strains than ligand. Vanadyl complex normalize glucose concentration in blood plasma by ameliorating the glucose uptake

through cytoplasmic membranes and inhibiting lipolysis. Vanadyl complex also play an important role in lowering the cholesterol level in blood.

Novel Functionalized Cellulose Acetate Based Hybrid Membranes in Gas Permeation Study

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Cellulose acetate (CA) is a widely applied glassy polymer in the preparation of gas separation membranes. In the present study, hybrid membranes were prepared by incorporating silica (Si) and functionalized silica (Si-CL) into the CA matrix, and their gas permeation abilities were explored with regard to CO₂, N₂ and CH₄ gases. The diffusion-induced phase separation (DIPS) method was adopted to make pure CA, CA/Si, and CA/Si-CL hybrid membranes. The concentration of Si-CL was varied as 10 wt%, 20 wt% and 30 wt% in the hybrid membranes. The analytical techniques employed for membrane characterization were Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), atomic force microscopy (AFM), and X ray-diffraction (XRD) analysis. The proper interaction of Si and Si-CL was confirmed by FTIR analysis. However, the homogenous surface textures of CA/Si, and CA/Si-CL hybrid membranes were evaluated through SEM. Furthermore, AFM analysis was performed to examine the surface roughness of these hybrid membranes. The changes in the crystallinity of CA were also examined by XRD analysis after adding Si and Si-CL. Moreover, the tensile strength of the CA/Si hybrid membrane was found to be better than that of CA/Si-CL hybrid membranes. CO₂, CH₄ and N₂ gases were used for gas permeation experiments at 400 kPa. Among CO₂ and CH₄ gases, the permeability of N₂ was high in CA/Si-CL hybrid membranes, and N₂/CO₂ selectivity of these membranes was 22.6.

Clarithromycin Nanoparticles Synthesis, Characterization and Enhancement of Antimicrobial Activities and Dissolution Rate

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Low solubility and bioavailability was the major concern in the past for macrolide antibiotic drugs. The solubility and dissolution rate were enhanced by preparing nanodrugs due to increase in surface area. In this research clarithromycin drug nanoparticles were prepared by using solvent-antisolvent precipitation method. The prepared drug nanoparticles were characterized by FTIR, SEM, TEM and XRD. Dissolution rate was studied by using Dissolution apparatus and High Performance Liquid Chromatography (HPLC) at different time intervals was used. The dissolution rate of nano drug showed a major enhancement as compared with the parental drug. No difference was observed in IR spectra of both parental drugs and nano drug of clarithromycin. X-Ray diffraction (XRD) showed the amorphous form of clarithromycin. The SEM images showed the nanosized particles of nanodrug. The antibacterial activities of both parental drug and nanoparticles were determined against *Staphylococcus aureus*, *E. coli*, and *Salmonella typhi* by agar well diffusion method. The nano drug showed better results as compared to the parental drug.

A study on antifungal potential of *Cassia fistula* linn

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Cassia fistula (*C. fistula*) L. is one of the most useful medicinal plant of family Fabaceae which has been used in different system of herbal medicine since ancient times. *C. fistula* has therapeutic importance in health care. Almost all parts of this tree show pharmacological activities. *C. fistula* is used against various diseases from primeval time. It is famous for healing treatments of various diseases so it is also called traditional healer tree. The extracts of *C. fistula* are reported anti-inflammatory action, controlling blood sugar level, cancer, and hepatic diseases etc. Many chemical constituents such as sitosterol, aurantimide, sugar, gluten, fistulic acid, and astringent have been isolated from *C. fistula*. The aim of this study was to evaluate the antifungal activity of different extracts of leaves and shoot of *C. fistula*. The aqueous, n-hexane, and methanol extract of *C. fistula* were analyzed against *C.albicans*, *S.cerevisiae* for antifungal activity. Phytochemical screening revealed that plant contains steroids, alkaloids, tannins, flavonoids, saponins and coumarins. The extracts show significant antifungal. For methanolic extract, the good activity was observed by *Candida albicans*. The result indicated that methanolic extract have better activity than aqueous extract. Therefore, *C. fistula* can be used as a good antifungal agent as natural source.

Determination of Antifungal potential of Aloe vera Gel

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Medicinal plants play an important role in traditional treatments to cure a variety of diseases. Aloe vera (*A. vera*) is one of these traditional herbal medicinal plant which belonging the family of Liliaceous. It is a cactus like plant with short stem and fleshy leaves, growing in hot and dry areas. Phytochemical compounds such as lignins, saponins, flavonoids, tannins, alkaloids, steroids and anthraquinon had been reported from the extract of *A. vera*. Reports show that it has antifungal, antibacterial, anti-inflammatory, antidiabetic, antiulcer and antioxidant activity. The plant has been used for the treatment of fever, inflammation, osteoarthritis, asthma, skin diseases, wound healing, diabetes, and stomach ulcers. The aim of the present study was to investigate the antifungal activity of *A. vera* gel against some pathogens. Three types of extracts that is

methanol, n-hexane and aqueous of *A. vera* gel analyzed for the antifungal activity against *Candida albicans* and *Saccharomyces cerevisiae*. The methanol extract of *A. vera* showed maximum inhibitory effect against *Candida albicans*. The present study depicted that methanol extract of *A. vera* has better antifungal activity than aqueous so it is more useful in medical treatments .

FACE MAGIC AND ANTI-MAGIC LABELING OF SUBDIVIDED PRISM GRAPH

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A labeled graph of type $(1, 1, 1)$, whose domain elements consist of union of edge set, vertex set as well as face set and range is the set of positive integers with maximum number is $v + e + f$. Here v , e and f are cardinality of vertex set, edge set and face set, respectively. The labeling of type $(1, 1, 1)$ is called Face magic(or Face Anti-magic resp.), if all faces of a graph have same(or different resp.) weight. In this paper, our main focus is on the problem of face magic and face anti-magic labeling of a subdivided prism graph of type $(1, 1, 1)$ with same difference d ; $d = 0$ or 1 .

On the Extremal Acyclic, Unicyclic and Bicyclic Graphs for General Platt Index

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The general platt index is a graph invariant which is denoted by PI_a and is defined as $PI_a(G) = \sum_{uv \in E(G)} (d_u + d_v - 2)^a$ where $E(G)$ is the edge set of the graph G , d_u is degree of the vertex $u \in V(G)$ and a is a real number different from 0 and 1. This talk will be focused on exploring the results concerning extremal acyclic, unicyclic and bicyclic graphs with respect to the invariant PI_a .

Evaluating the effect of process parameters on biogas yield and process stability during anaerobic co digestion of cattle manure with green grocery waste in two stage reactor

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According to international association of natural gas vehicles (2010) statistically Pakistan having highest number of natural gas vehicles that was 2.67 million. As Pakistan facing energy crises and these vehicles run on natural gas. To overcome this, anaerobic digestion is one of the promising technology to generate energy (biogas) from renewable resources and has several environmental benefits. In single stage anaerobic digestion at higher organic loading rate the process fails due to volatile fatty acids (VFAs) accumulation. For high biogas production the system should be operated at high loading rate with stable process in two stages. The aim of the study was to enhance the biogas in two stage anaerobic digestion by high VFAs loading rate. The two stage anaerobic digestion was carried out in reactors with working volume 5 L, flow rate 0.5 L day⁻¹ and retention time was 10 days The biogas yield at 3, 3.5, 4, 4.5, 5, 5.5, 6, and 6.5 g VS L⁻¹ Day⁻¹ were 0.468, 0.382, 0.365, 0.345, 0.318, 0.242, 0.292 N L/g VS. The highest biogas yield was achieved at 3 g VS L⁻¹ Day⁻¹. The study concludes that the process was stable at higher loading rates but with increasing loading rate the biogas yield decreases.

Synthesis and optical study of novel ligands with different transition metals

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This research work deals with the synthesis of novel carboxylates ligands which will be further used to design new complex structures of different metals. Metal complexes are emerging on the interface between material science and coordination chemistry. Metal complexes are the important class of materials of one, two, or three dimensional networks formed by multidentate organic linkers and metal ions. In this study first some novel carboxylates will be synthesized and then with different combinations of metals and solvents new complexes will be synthesized with different metals. The present research provides an efficient, simple and environment friendly synthesis methods. The cost effective approach will also be adopted by carrying out the synthesis under ambient temperature and pressure conditions and novelty will be induced by designing new ligands. The newly made complexes will be characterized by using different techniques such as Fourier transform infrared spectroscopy (FTIR) and UV-visible Spectroscopy.

Optimum conditions for synthesis of CeO₂-SiO₂ nanocomposite for degradation of Pesticide

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CeO₂-SiO₂ nanocomposite was synthesized in presence of anionic surfactant at different pH (9, 10, 11) and Temperatures (30°C, 50°C and 70°C) conditions. Synthesized through sol-gel method, all 6 nanocomposites were employed for catalytic degradation of harmful organophosphorous pesticide in aqueous medium. CeCl₃·7H₂O was used as precursor of CeO₂ whereas SiO₂ was extracted from rice husk using conventional acid leaching method.

Conversion of cerium salt into oxide form was confirmed using Photoluminescence spectroscopy, where a clear indigo colored emission was obtained for electronic transition from Ce+4-4f to O-2-2p orbital. Further characterization was done using FTIR, XRD, UV-Vis spectroscopy and TGA. XRD analysis confirmed the presence of CeO₂ and SiO₂. Band gap was calculated using absorption data and was found in range of 3.02 to 4.55eV. Catalytic efficiency of all prepared nanocomposite was determined by calculating percentage degradation and rate constant (min⁻¹) for degradation of pesticide at ambient conditions.

Structural studies of silver complexes with N,S donor ligands

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Three silver complexes with N, S donor ligands L1, L2, and L3 were synthesized (L1 = 2-mercaptobenzimidazole, L2 = 2-mercaptobenzothiazole). Ligand L3 was prepared by the reaction of 2-mercaptobenzimidazole with sodium borohydride in THF. The synthesized complexes were characterized on the basis of ¹H NMR, ¹³CNMR, FTIR, TGA, powder XRD and elemental analyses. Powdered XRD revealed that complexes 2, 3 are amorphous while 1, 4 and 5 are crystalline. The thermogravimetric analysis suggested that the complexes 1, 3, 4 and 5 are quite stable up to 200 °C and the decomposition to metallic silver takes place around 600 °C. These complexes were screened for their antibacterial activity against *B. thuringiensis* and *E. coli* and exhibited appreciably enhanced activity compared to free ligand.

Study of electronic properties of SrSnO₃

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In this thesis generalized gradient approximations (GGA) were used to study the electronic properties of SrSnO₃ within the frame work of Density Functional Theory (DFT). For study the electronic properties investigation of quantum degenerate electronic states of SrSnO₃ have been described in the Projected Density of States. Observations shows that SrSnO₃ have ductile nature and physically stable semiconductor with an indirect band gap of 1.8 eV. And its behavior is quasi metallic nature near Fermi level due to Sr-O degenerate states.

Synthesis, Structure and Properties of Fe Doped ZnO Nanoparticles

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Sol-gel synthesis of pure and Fe doped (5, 10, 15 and 20%) ZnO nanoparticles were prepared using appropriate precursors followed by annealing at 600°C for 2 hours. Resulting materials were characterized by X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM) and Ultraviolet-Visible spectroscopy (UV-Vis). XRD spectra confirm the formation of highly crystalline and pure phase ZnO nanoparticles with hexagonal wurtzite structure. Fe doping give rise to slight changes in peak intensities, peak widths and crystallite size (31-38.8 nm) which indicates that Fe has successfully dissolved into ZnO without altering host crystal structure. SEM reveals predominant spherical morphology for undoped samples with presence of small amounts of rods and sheet like structures in doped samples. UV-Visible spectra show maximum absorbance in the UV-Vis region with a significant increase in band gap energies upon doping from 3.12 to 3.64 eV.

Elastic properties of SrTcO₃ under pressure DFT study

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The structural, electronic and thermo-elastic properties of cubic SrTcO₃ at have been studied in the frame work of Density Functional Theory by using FP-LAPW method with GGA functional under pressure. Designed for electronic properties, detailed analysis of quantum degenerate electronic states of SrTcO₃ have been defined on the grounds of Density of States(DOS's). Elastic properties relates to anisotropy, elastic moduli's, elastic wave velocities, Debye temperature and thermal stability were calculated and explained that has not been found in literature. Also the brittle nature and indirect band-gap of the compound is 0.4eV. Spin dependent DOS's plots show invariant anti-ferromagnetic nature of the compound under pressure.

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