POSTER PRESENTATION

PP-1

NANOCATALYSIS: UNLOCKING THE POTENTIAL OF NANO-SIZED CATALYSTS FOR A SUSTAINABLE FUTURE

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In the era of nanoscience, where devices and technologies continue to shrink in size while enhancing their properties, catalysis emerges as a crucial field of application. Our laboratory is dedicated to exploring the utility of nano-sized catalysts in everyday life, aiming to benefit humanity. At the heart of nanocatalysis lies the unique properties conferred by the nanoscale dimensions, shape, and exceptionally high surface area to volume ratio of catalysts. These characteristics induce structural and electronic changes that set nanocatalysts apart from their bulk counterparts. This mini-review delves into the foundational understanding of nanocatalysis, elucidating how the distinctive catalytic and other properties of nanomaterials are intricately tied to their size and atomic-level structure. Exploring the applications of nanocatalysts, we find their significance in diverse realms such as water purification, fuel cells, energy storage, composite solid rocket propellants, biodiesel production, medicine, dyes, and the utilization of carbon nanotubes. In each of these areas, nanocatalysts play pivotal roles, offering enhanced performance and efficiency compared to conventional catalysts. Whether it's cleaning up polluted water sources, powering clean energy technologies, or advancing medical diagnostics and treatments, nanocatalysts hold promise for addressing myriad societal challenges and improving quality of life.

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PP-2

MICROWAVE-ASSISTED GREEN SYNTHESIS OF CuO NANOPARTICLES AND THEIR APPLICATION IN PHOTOCATALYTIC H_2 EVOLUTION

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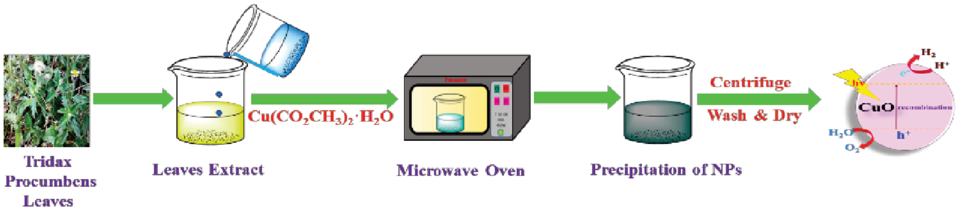

Fig: Green synthesis CuO NPs and H_2 evolution

A high-efficient photocatalyst is essential for photocatalytic hydrogen production from water splitting. The utilization of plant leaf extracts for synthesis of nanostructured materials is a non-toxic and environmentally friendly method [1,2]. In this study, CuO Nps were synthesized by microwave assisted technique using *Tridax Procumbens* plant leaf extract. The photocatalytic activity of green synthesized CuO NPs (G-CuO) was compared with commercial CuO (C-CuO) The activity is studied in different sacrificial agents such as TEOA, methanol, iso-propyl alcohol, glycerol, n-butyl alcohol. The highest H_2 production rate around 2043.21 μmol g^{-1} h^{-1} was obtained for G-CuO NPs in presence of TEOA under visible light, unlike C-CuO NPs. At optimum condition, G-CuO NPs demonstrate good photostability for H_2 evolution up to 5th cycle. Characterizations of synthesized materials were carried out using XRD, FT-IR, TGA, UV-DRS, BET and FE-SEM. The electrochemical measurement such as linear sweep voltammetry (LSV) and electrochemical impedance (EIS) was performed by three electrode cells. G-CuO NPs are more preferable due to their low band gap energy, improved response to visible light and reduced e^-/h^+ recombination rates.

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PP-3

BIOGENIC SYNTHESIS OF FE_3O_4 AND ITS FUNCTIONALIZATION TO FE_3O_4@C-SO_3H: COMPARATIVE PHOTOCATALYTIC DYE DEGRADATION STUDIES

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Present work describes eco-friendly preparation of Fe_3O_4 employing agro waste lemon peel ash extract solvent medium, and further functionalised using residual ash after the extraction used for the adsorption on a Fe_3O_4 followed by sulphonic acid functionalised by a hydrothermal method described. The prepared materials were characterized by UV-Vis, FT-IR, XRD, FESEM, EDX, VSM and TGA techniques. Further, the prepared catalysts $Fe_3O_{4,}$ Fe_3O_4@C, and Fe_3O_4@C-SO_3H were comparative studied for the photocatalysis of methylene blue (MB), methyl orange, (MO), and calcancarboxylic acid (CA). The studies revealed that, sulfonic acid functionalised and carbonized on Fe_3O_4 performed very good photocatalytic activity of the dye degradation compared to Fe_3O_4. The degradation reaction was monitored by UV-Vis wavelength maxima for 664 nm for MB, 590 nm for MO, and 550 nm for CA. The photodegradation showed promising for MB removal up to 95.98%, for MO 82.55% and for CA 88.53% achieved in sunlight about 16 h. The catalyst developed by simple method, inexpensive and showed good decolorization of the dye of MB, MO, and CA respectively.

Keywords: Eco-friendly, Agro-waste, Magnetic, Photo catalytic, Surface functionalization

PP-4

METAL-ORGANIC FRAMEWORK (MOF) BASED LUMINESCENCE SENSORS OUTLINE: A FACILE PLATFORM FOR RAPID SENSING OF PESTICIDES FROM EFFLUENT

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Pesticides are chemical matter or biological agents broadly used in agroindustry that deters,incapcitates and assassinate pests. Several pesticides are released in the environment through varied agricultural and industrial activities which results in the contamination of surface and ground water which leads to dangerous environmental problems that pose significant hazards to health of human being as well as ecosystem. In order to get rid of toxic pollutants the development of sensitive and convenient sensors for the onsite detection of pesticides is essential to overcome practical limitations encountered in conventional methodologies, which require skilled manpower at the expense of high cost and low portability. In this regard, the role of novel, advanced functional materials such as metal–organic frameworks (MOFs) has drawn great interest as an alternative for conventional sensory systems because of their varied benefits over other materials. This review was organized to address the recent advances in applications of MOFs for sensing numerous pesticides because of their tailorable optical and electrical traits. Therefore sensing of these pesticides from aqueous environment has attracted global researchers keenly. Finally, the new limitations and possibilities of MOFs for the sensing of pesticides are presented.

Keywords : Metal organic framework;detection;pesticides;luminescence sensors;effluent

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PP-5

ZnO-BIOPOLYMER NANOBIOCOMPOSITES: CHARACTERIZATION AND APPLICATION IN DEGRADATION OF DYES

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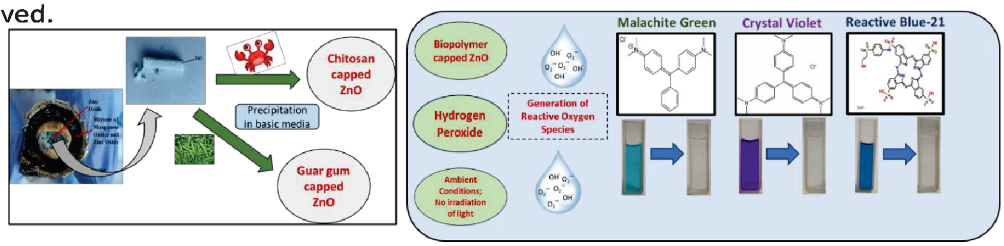
Biopolymeric capped or encapsulated metal oxide nanobiocomposites has received a lot of attention in different areas including environmental applications. The capping with a biopolymer can help in preventing the aggregation of the nanomaterial increasing its stability and thus enhancing the catalytic properties of the material [1]. Among the metal oxides, Zinc Oxide (ZnO) is widely used in Advanced Oxidation Process (AOP) for the treatment of water pollution. As an alternative to the Zinc salts, Zinc Oxide available as an electrode in spent alkaline batteries which are produced in millions annually can be used as a source of zinc to prepare ZnO based nanomaterials [2]. Chitosan, a β-(1-4) acetyl-D-glucosamine is a linear cationic biopolymer which has modifiable amino and hydroxyl functional groups and compatibility towards the metal oxides [3]. Guar gum is a natural polysaccharide possessing a β-(1→4) linked-D-mannopyranosyl backbone with α-D-galactose units at branch points which are glycosidically linked to O-6-position of every second mannose unit [4]. On the other hand, with the rapid development of textile industries, an enormous amount of industrial dye effluent is produced that has led to serious threats to aquatic environments and human beings. This work describes the synthesis of Chitosan and Guar gum capped ZnO nanobiocomposites (ZCS and ZGG) by precipitation technique and its use in catalytic degradation of dyes in a novel way i.e., the degradation without irradiation of external light in presence of Hydrogen Peroxide (H_2O_2). The fabricated nanobiocomposites were characterized with various analytical techniques such as UV-Visible spectroscopy, Fluorescence, Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), Powder X-Ray Diffraction Spectroscopy and X-Ray Photoelectron Spectroscopy. Malachite Green (MG), Crystal Violet (CV) and Reactive Blue-21 (RB-21) were used as model dyes to check the efficiency of the catalysts. Further the study was extended to the binary mixture of the above-mentioned dyes. Scavenging agents were used to know the involvement of Reactive Oxyegn Species (ROS) in the degradation. Also, to check for the mineralization, COD studies were conducted wherein significant reduction in COD was observed.



Keywords: Zinc Oxide; Biopolymer; Chitosan; Guar gum; Dye; Binary mixture

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PP-6

FACILE SYNTHESIS OF BENZOTHIAZOLE BASED AIE FLUORESCENT PROBE FOR VISCOSITY SENSING

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Viscosity regulates the diffusion process, which is essential to many biological processes. Researchers hypothesize that aberrant variations in intracellular reactive substances are correlated with abnormal variations in cell viscosity. Fluorescent molecular rotors are frequently used to map and quantify this type of microviscosity in living cells. Herein, we report a simple benzothiazole based fluorescent probe BTZPA for viscosity detection. BTZPA was characterized using NMR, IR, HRMS and SCXRD. An excellent FL quantum yield of 0.16 was obtained. Photophysical properties such as Solvatochromism, pH stability, aggregation studies, methanol: glycerol studies were investigated. The probe was subjected to in vitro cytotoxicity and imaging studies. Computational studies viz. DFT and ADME profiling was also performed to compliment the experimental findings.

Graphical Abstract, If any in High Quality Resolution

Keywords: Viscosity; fluorescent; molecular rotor; DFT; imaging

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.**PP-7**

NOVEL BIOINSPIRED PORPHYRIN PHOTOSENSITIZER FOR TRANSESTERIFICATION OF SESAME OIL UNDER VISIBLE LIGHT AT AMBIENT CONDITIONS

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The natural sources of petroleum production are getting depleted with more rate of consumption that it produced. Hence the researcher introduces a groundbreaking

approach to the increase biofuel production by using transesterification waste cooking sesame oil. The novel bioinspired porphyrin photosensitiser was synthesized and tested for the biodiesel production from waste cooking sesame oil visible light irradiation at ambient condition. The porphyrin photosensitizer was confirmed by FT-IR, NMR, Powder-XRD, XPS. The proton level and redox potential of the porphyrin photocatalyst was determined by using UV-Vis. Spectrophotometer and cyclic voltammetry. The protocol found eco-friendly and sustainable and obeyed green chemistry principles, transforming waste cooking oil to biodiesel under metal/base/additive-free conditions in a home-made photoreactor under illumination of 5 LED light. Biodiesel obtained was blended (15%) with commercial diesel and found comparable physicochemical properties with marketed diesel sample. The protocol afforded gram scale production of biodiesel using optimized reactions with 90% yield.

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PP-8

RIETVELD REFINEMENT ANALYSIS OF HD PROCESSED EOL $Nd_2Fe_{14}B$ MAGNETS

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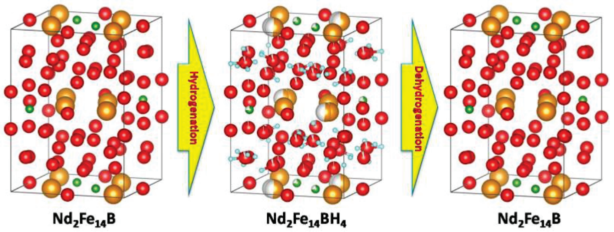
Developments in permanent magnet technologies have considerable contribution in the improvement of electronic equipment with high performance. High performance electric motors with minimum electric consumption are inevitable to enhance the efficiency and reduce the price of electric vehicles. For this, $Nd_2Fe_{14}B$ based motors are widely using considering their incredible performance though they are costly. For resource efficiency and circular economy, indigenous $Nd_2Fe_{14}B$ magnets from the secondary raw materials is a new area of research which includes recycling of spent magnets from BLDC motors, hard disc drives, wind turbines, speakers, MRI machine etc,. Oxidation or corrosion is one of the major challenges during spent $Nd_2Fe_{14}B$ magnet recycling process. Cconventional mechanical crushing for converting magnet to powder will result in huge oxygen uptake and also requires more efforts. Hydrogen Decrepitation (HD) is the best method for embrittlement of bulk $Nd_2Fe_{14}B$ magnets in to fine powder[1]. An attempt has been made at room temperature with 2 bar Hydrogen pressure, the bulk $Nd_2Fe_{14}B$ magnets decrepitated in to powder form without any additional energy source through penetration of hydrogen in to the $Nd_2Fe_{14}B$ lattice. Consequently the hard magnetic $Nd_2Fe_{14}B$ converted in to soft magnetic $Nd_2Fe_{14}BH_x$ phase. To retain the hard magnetic phase of $Nd_2Fe_{14}B$, absorbed hydrogen completely removed through high temperature vacuum treatment. In this paper, we are reporting the hydrogen decrepitation and dehydrogenation processes of spent $Nd_2Fe_{14}B$ magnets. The structural modifications during the reactions were traced from the Rietvel refinement analysis of XRD pattern. Further, elemental composition and magnetic properties in the recycled $Nd_2Fe_{14}B$ alloy powder is studied using ICP-OES and VSM analysis respectively. Morphology of recycled $Nd_2Fe_{14}B$ alloy particles is evaluated using FE-SEM images. Results of such an investigation will be presented. .



Keywords: $Nd_2Fe_{14}B$permanent Magnets, Recycling, Hydrogen decrepitation

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PP-9

BRONSTED ACID FUNCTIONALIZED PORPHYRIN FOR METAL-FREE BUCHWALD-HARTWIG TYPE COUPLING IN A HOME-MADE PHOTOREACTOR

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Heterocyclic nitrogen-containing derivatives are widely used in fine chemicals, medicines, organic electronic materials, and agrochemicals. Specifically, 1,2,4-triazole compounds have shown diverse antifungal properties and found part of many important drugs such as sitagliptin, deferasirox and triazolam. Besides, 1,2,4-triazoles, have been popular as compliant ligand for the formation of metal complexes and as antihypertensive, antifungal agents. It was observed that the formation of N-substituted 1,2,4-triazole was reported by cheaper metal catalysts at milder conditions with less time and good yields. Nevertheless, present approaches have some prospective constraints because these conversions frequently use costly transition-metal catalysts such as Pd, Rh, Co and Ni complexes. Moreover, contamination of metal in the final product due to leaching is the major issue in fine chemical and pharma industries. Therefore, screening out environmentally friendly protocol for the formation of N-substituted azole continues to be a serious challenge. To meet these requirements, metal/additive free photocatalytic technique could be a boon that afford desired compounds at room temperature by exposure of visible light. A novel porphyrin photocatalyst was synthesized and characterized by NMR, FT-IR. The proton level and energy band gap were determined by UV-Vis. Spectrophotometer. Porphyrin photocatalyst found efficient for metal-free Buchwald-Hartwig type coupling of 1,2,4-triazole with aryl halide in a home-made photoreactor by exposure of (5W LED) visible light. The photocatalyst was reusable and different substrates afforded N-substituted products in admirable yields (76-82%) at an ambient condition. The protocol also achieved N-substitution of other heterocyclic compounds like imidazole, benzimidazole, indole.

Key words : (1,2,4-triazole, porphyrin photocatalyst, aryl halide, 5W LED)

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PP-10

A FORCED DRAFT RETROFIT TO IMPROVE COOKSTOVE PERFORMANCE: LABORATORY BASED EVIDENCE

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Incorporating forced-draft air in improved and traditional cookstoves has been shown to potentially decrease harmful emissions while increasing efficiency, thereby helping in providing health and climate co-benefits by reducing exposures and fuel consumption. In this work, the laboratory-based performance of a battery-powered forced-draft retrofit accessory was used with a traditional and an improved cookstove using the BIS-IS-13152 protocol. The results were compared to their natural draft counterparts (without the use of the retrofit device). The thermal efficiency was improved for both improved and traditional stoves. The thermal efficiency in case of traditional cookstove by natural draft was found to be 17.30% while using forced draft retrofit the thermal efficiency significantly increased to 25.40%. The thermal efficiency of improved natural draft cookstove was found to be 22.85%, and by using forced draft retrofit, the thermal efficiency increased to 28.25%. Preliminary analysis of the emissions showed that PM was reduced by >50% for the improved cookstove. Such a retrofit device would be able to provide significant health and climate co-benefits, even for traditional stoves with low thermal efficiency. However there may be challenges associated in real-world conditions, especially in rural and remote areas due to use of non-conventional fuels such as cow-dung, limited access to electricity, and cooking of foods which require simmering (eg. rice) which can potentially act as barriers to complete adoption of this technology.

PP-11

SEPARATION AND PRE-CONCENTRATION OF RARE EARTH ELEMENTS FROM GEOLOGICAL SAMPLES USING Fe_3O_4@APTES NANOPARTICLES

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The geochemical and strategic importance of Rare Earth Elements (REEs) given their applications in the nuclear industry, defence, energy, electronics, high-tech alloys, superconductors, super magnets, marine geochemistry and petro geochemical studies demands their determination from percentage to trace and ultra-trace level. The determination at microgram and sub microgram level of REEs requires pre-concentration and separation from major matrix elements. The direct determination of REEs by Inductively Coupled Plasma - Optical Emission Spectrometer (ICP-OES) at trace and ultra-trace level becomes difficult due to low abundance of Heavy Rare Earth Elements which falls below the detection capability of an instrument.

Among various methods of pre-concentration and separation, Solid Phase Extraction (SPE) method is used as it is simple to implement, has quick separation and has a high pre-concentration factor [1]. The high surface-to-volume ratio of nanoparticles makes them an efficient adsorbent for many elements compared to other ordinary adsorbents. Due to the merits of fast and simple phase separation by the external magnetic field of magnetic solid phase extraction (MSPE), 3-Aminopropyl triethoxysilane (APTES) functionalized magnetic Fe_3O_4 nanoparticles can be efficient adsorbent for pre-concentration and extraction of REEs from geological samples at ultra-trace concentration [2]. Considering the strong adsorption capacity of magnetic Fe_3O_4@APTES nanoparticles for target elements, a method of MSPE-ICP-OES was developed for the determination of trace/ultra-trace REEs in geological samples.

Application of this method for pre-concentration of REEs was seen in pre-analyzed geological samples of Dantala area, Siwana, Barmer district, Rajasthan and more than 90% recoveries was obtained under optimized conditions. The results demonstrate the high adsorption efficiency of Fe_3O_4@APTES nanoparticles for pre-concentration and separation of REEs in geological materials using the MSPE-ICP-OES technique.

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PP-12

Thermogravimetric Analysis Doped Polymers synthesized by Hydrothermal method for Environmental Applications

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The present investigation aims at the comparative study of thermogravimetric analysis of doped polymers synthesized by hydrothermal method. PAni is stable, cheap polymer used to prepare potential materials having environmental applications[1]. The newly prepared and purified doped polyanilines were found to be bluish green in colour. The obtained polyanilines were prepared by insitu doping of organic acids on polyaniline in appropriate molar proportion in laboratory by employing insitu chemical oxidative polymerization technique under hydrothermal condition. All new doped polyanilines were abbreviated as PNBAPAni, SCYAPAni, CNMAPAni, SPHAPAni, ANNAPAni, BNZAPAni. TG curves of PAni, PNBAPAni, SCYAPAni, CNMAPAni, SPHAPAni, ANNAPAni & BNZAPAni were compared.

Doped polyaniline shows good stability than conventional polymers[2][3]. PNBAPAni was shown higher thermal stability as compare to other doped polymers. Experimental results obtained were indicates that doped polymers of polyaniline shows good thermal stability than other conventional polymers.

Keywords: Polymer, Polyaniline, Thermogravimetric, Hydrothermal method.

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PP-13

THERMOGRAVIMETRIC STUDY OF GOPANI POLYMER COMPOSITES SYNTHESIZED BY HYDROTHERMAL METHOD FOR POTENTIAL APPLICATIONS

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The present research article aims at the comparative study of thermal stability of GOPAni polymer composites synthesized by hydrothermal method. PAni shows various oxidation states with high redox reversibility and it has rapid change in the film shade with the change in its potential. It also shows high stability in normal atmospheric conditions and potential applications. The obtained GOPAni polymer composites were prepared by insitu doping of graphene oxide on polyaniline in appropriate molar proportion through oxidative polymerization under hydrothermal condition. All new synthesized GOPAni polymer composites were abbreviated as GOPAni-1, GOPAni-2, GOPAni-3 and GOPAni-4. Thermogravimetric study of GOPAni polymer composites was carried out and TG curves of PAni, GOPAni-1, GOPAni-2, GOPAni-3 and GOPAni-4 were compared.

GOPAni polymer composites were shown good stability than conventional polymer composites. GOPAni-1 was shown comparatively higher thermal stability and higher thermal degradation temperature. It was proved from experimental results that thermal stability of the composite increased with change in the composition of graphene oxide in the composite.

Keywords: Graphene Oxide, Polyaniline, Composites, Thermogravimetric Analysis.

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PP-14

TUNING THE MORPHOLOGIES OF ZnO FOR ENHANCED PHOTOCATALYTIC ACTIVITY

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Facile one-pot method to prepare three-dimensional hierarchical nanostructures of ZnO with good control over their morphologies and enhanced photocatalytic activity was developed by proper selection of template, base and microwave irradiation conditions in pure water. Synthesized ZnO products were characterized by XRD, SEM, BET, and TGA. The effect of morphology on the decolorization of rhodamine B solution under UV light irradiation was investigated. The ZnO nanorods originating from the center (Tetrapods) exhibits enhanced photocatalytic activity in the degradation of Rhodamine B under UV light irradiationq[1]. This high degradation efficiency (98.86%) can be attributed to the large percentage of the exposed [101] facet[2,3], (facet dependent) even though surface area is relatively lower. Photocatalytic study reveals that the decomposition of Rhodamine B follows a first order kinetics regardless of the morphology of ZnO particles. The rate constant for nano tetrapods of ZnO particles is the highest (0.036 min^{-1}), while the rate constant for nano coral reefs is lowest (0.003 min^{-1}). Moreover, the photocatalyst exhibits excellent durability, allowing it to be utilized for at least five consecutive cycles without losing its effectiveness[4]. This study signifies the dependence of enhanced photocatalytic activity on morphology but not the surface area of material.

Keywords: ZnO nanoparticles, Microwave-assisted, Photocatalytic activity, Rhodamine B, Kinetics.

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PP-15

$Ag_2V_4O_{11}$ NANOFLAKES MEDIATED PHOTOACTIVATION OF PEROXYMONOSULFATE ION FOR ENHANCED DYE DEGRADATION AND INTRINSIC BACTERICIDAL ACTIVITY

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We report the synthesis of di-silver tetra vanadate ($Ag_2V_4O_{11}$) nanoflakes by facile hydrothermal method for peroxymonosulfate (PMS) activation under visible light irradiation for efficient degradation of both cationic and anionic dyes. Almost 100% degradation of Methylene Blue was observed in just 45 min using $Ag_2V_4O_{11}$ in presence of PMS, while only 24% degradation was observed for only $Ag_2V_4O_{11}$ that too in 150 min, which affirms that there is a synergistic effect of visible light photocatalysis and PMS activation within $Ag_2V_4O_{11}$. The rate constant for the degradation of Methylene Blue over $Ag_2V_4O_{11}$ photocatalyst in the presence of PMS (1.48 mM) ions was 7.138×10^{-2} min^{-1} which is about 41.02 times higher than that for only $Ag_2V_4O_{11}$. The $Ag_2V_4O_{11}$/PMS couple can be employed to deal with environmental threats arising due to ever-increasing industrialization. Furthermore, the antibacterial properties of $Ag_2V_4O_{11}$ were scanned using *E. coli* and *S. aureus* by the well-plate diffusion method. $Ag_2V_4O_{11}$ showed excellent antibacterial activity for both gram-positive and gram-negative bacteria, which endorses $Ag_2V_4O_{11}$ as a promising antibacterial material for a wide range of disinfection.

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PP-16

MODIFIED SYNTHESIS OF SILVER ZIRCONATE AS AN EXCELLENT VISIBLE LIGHT ACTIVE PHOTOCATALYST FOR ENERGY AND ENVIRONMENTAL APPLICATIONS

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Here we report the environmentally benign co-precipitation protocol for the synthesis of Ag_2ZrO_3[1–3] at room temperature. The synthesized material was well characterized and employed for catalyzing dye sensitized hydrogen production via photocatalytic water splitting, photoactivation of persulfate (PS) ion and also for antibacterial activity. Ag_2ZrO_3 exhibits almost 100% Rh B (2.1×10^{-5} M) dye degradation in just 90 min under visible light irradiation in presence of PS, whereas only 43.4% Rh B degradation was observed in absence of PS, which validates the role of Ag_2ZrO_3 in the photoactivation of PS ion. The as-synthesized Ag_2ZrO_3 alone generates 310 $\mu molg^{-1}$ of hydrogen, while only EY is also capable of generating 834 $\mu molg^{-1}$ of H_2. However, EY and Ag_2ZrO_3 together, drastic increase in the amount of hydrogen generated (2288.94 $\mu molg^{-1}$) was observed in just 4 hrs. Additionally, Ag_2ZrO_3 also exhibits outstanding bactericidal[4] activity against E. coli and S. aureus under dark and light. These varieties of application mentioned above endorses the suitability of robust Ag_2ZrO_3 for a wide range of environmental remediation.

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PP-17

GREEN SYNTHESIS OF COPPER OXIDE NANOPARTICLE USING LEAF EXTRACT OF CASSIA TORA AND ITS ANTIOXIDANT/ANTIBACTERIAL ASSAYS

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The discipline of nanoparticle biosynthetic science is still being developed, but it is anticipated to have a significant long-term impact on many manufacturers. Due to the growing demand for environmentally benign technology for material synthesis. Green chemistry is cost-effective, non-toxic, and favourable to the environment. The plant extract incorporates a variety of secondary metabolites that function as reducing and stabilizing agents in the bioreduction procedure to create new metallic nanoparticles. Nanoparticles are created through non-biological techniques (chemical and physical), which are extremely dangerous and harmful to living things. Additionally, the biological synthesis of metallic nanoparticles is a simple, low-cost, and environmentally safe process. Plants are effectively employed to create a variety of greener nanoparticles, including copper oxide. Additionally, the plant-mediated nanoparticles hold promise as a treatment for a number of illnesses, including cancer, HIV, hepatitis, malaria, and other acute illnesses[1].

Copper oxide nanoparticles are essential technology materials that are utilized as catalysts in the chemical industry, as well as in photonic and electronic devices and medical applications. In the present article we have developed an eco-friendly, phytosynthetic and straightforward method for the synthesis of nearly CuO nanoparticle using leaf extracts of Cassia tora as green reducing agent. Copper (II) sulphate pentahydrate ($CuSO_4.5H_2O$) was used as precursor. The reduction of Cu^{II} was visually observed by the change of colour from light green to brown with formation of precipitate. As synthesized material were also characterized in detail at the structural, electronic level and morphological authentication by XRD, FT-IR, XPS, SEM, TEM, BET and AFM. The antioxidant property was obtained by α, α-diphenyl-β-picrylhydrazyl (DPPH). Ethanolic extracts were used for the antioxidant activity. Moreover, the antibacterial activity of CuO nanomaterial was tested against human pathogenic bacteria i.e. gram-positive Staphylococcus aureus, Klebsiella pneumoniae and gram-negative Escherichia coli. Result rendered effective antibacterial activity against Escherichia Coli[2].

Keywords: Copper oxide nanoparticles, green synthesis, Cassia tora leaf extract, Spectroscopy, antioxidant, antibacterial assay.

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PP-18

SYNTHESIS OF NANOPARTICLES USING *ANNONA SQUAMOSA* LEAVES AND ASSESSMENT OF ITS ANTIOXIDANT ACTIVITY

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Annona squamosa is a fruit bearing plant possesses potent bioactive compounds in all its part. In this present investigation zinc oxide nanoparticles were synthesized from hydro ethanol extract of *Annona squamosa* leaves at 60^0C temperature. Production of zinc oxide nanoparticles in extraction is detected by UV–V spectrophotometer, X-ray Diffraction spectroscopy, scanning electron microscopy was employed to analyse the structure of nanoparticles. Fourier transform infrared spectroscopy (FT-IR) analysis were performed, in order to determine the functional groups on *Annona squamosa* leaves extract. The synthesized zinc oxide NPs shows potential antioxidant activity by using nitric oxide scavenging and superoxide dismutase assay and there is dose dependant activity. Our reports confirmed that the *Annona squamosa* leaves is a very good eco-friendly and nontoxic bio reductant for the synthesis of zinc oxide nanoparticle and opens up further opportunities for fabrication of drugs towards various therapies.

Keywords: Annona squamosa leaves extract; zinc oxide NPs; Antioxidant activity; bioactive components; green synthesis.

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PP-19

Cu/Ni-BDC@MWCNT: A SYNERGISTIC APPROACH TOWARDS SUPERIOR ELECTROCHEMICAL PERFORMANCE

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In view of poor electronic conductivity and inferior structural stability, the direct application of Metal-organic Frameworks (MOFs) as an electrode material is limited. Herein, the carboxylated Multi-wall carbon nanotubes (MWCNT) are utilized as a substrate for the in situ growth of bimetallic Cu/Ni based MOFs (Cu/Ni MOFs). The flake like Cu/Ni MOFs@MWCNT composite was successfully synthesized using benzene 1, 4 dicarboxylic acid as a ligand by simple solvothermal approach. In the composite, MWCNT is wrapped with 2D Cu/Ni MOF nanosheets through some bonds and affinity between MWCNT and Cu/Ni MOF. The morphology and textural characteristics of synthesized MOFs and MOF composite were characterized by Scanning Electron Microscopy (SEM) and Brunauer-Emmett- Teller (BET), whereas the crystal structure and chemical composition were determined by X-ray powder diffraction (XRD), Fourier Transform Infrared Spectroscopy (FT-IR) and X-ray Photoelectron Spectroscopy. Due to the unique structure and good synergistic effect, the Cu/Ni-BDC@MWCNT composite exhibits excellent electrochemical performance in energy application as well as electrochemical sensing application. The Cu/Ni-BDC@MWCNT composite demonstrates a large specific capacitance (1121 F/g at 1A/g), good cyclic stability, low internal resistance and charge transfer resistance. Moreover, the synthesized materials were used in the application of electrochemical sensor for effective determination of antibiotics in different types of samples (Pharmaceuticals, milk and water samples), in which kinetics were due to diffusion controlled electrochemical process. The Cu/Ni-BDC@MWCNT composite modified electrode delivered excellent sensor parameters with a high sensitivity, large linear range with an acceptable limit of detection. Further, in depth studies such as selectivity and durability were carried out to verified the effectiveness of the sensor. This work shows that the Cu/Ni-BDC@MWCNT composite could be a potential and promising electrode material for the supercapacitor and electrochemical sensing application.

Keywords: Cu/Ni-BDC@MWCNT composite, Supercapacitors, Electrochemical sensors.

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PP-20

RECENT ADVANCES IN NANOMATERIAL SYNTHESIS AND SURFACE PLASMON RESONANCE OPTIMIZATION FOR PHOTOCATALYTIC DEGRADATION OF ORGANIC DYES IN WASTEWATER

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The study highlights recent strides in the synthesis of nanomaterials tailored for the efficient removal of organic dyes from wastewater through photocatalytic degradation. With growing environmental concerns, the development of advanced materials capable of addressing water pollution has become imperative. This article provides a comprehensive overview of the latest methodologies and techniques employed in the fabrication of nanomaterials with enhanced catalytic properties. Various classes of nanomaterials, including metal nanoparticles, metal oxides, and carbon-based nanomaterials, are discussed in detail, focusing on their synthesis routes and structural modifications aimed at optimizing surface plasmon resonance (SPR) properties. The role of SPR in augmenting light absorption and charge carrier dynamics crucial for photocatalytic activity is elucidated, emphasizing its significance in enhancing the efficiency of organic dye degradation. Furthermore, mechanistic insights into the photocatalytic degradation process mediated by SPR-enhanced nanomaterials are discussed, shedding light on key reaction pathways, intermediate species, and surface interactions involved. The review concludes with a discussion on the practical implications of these advancements for sustainable wastewater treatment and environmental remediation, emphasizing the need for further research to address challenges such as scalability and cost-effectiveness.

Keywords: Nanomaterials, Organic dyes, Photocatalytic degradation, Surface Plasmon Resonance.

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PP-21

IONIC CONDUCTIVITY OF NANOCRYSTALLINE $Ce_{1-x-y}La_xCa_yO_2$ AS AN ELECTROLYTE FOR SOLID OXIDE FUEL CELLS

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Solid oxide fuel cells (SOFCs) are being developed as green energy devices. The oxide ion conducting ceramics such as YSZ and CeO_2 based materials are used as electrolytes in SOFCs. Till now verities of oxide ion electrolytes have been investigated for intermediate temperature (500-800 ^{0}C) SOFCs. But all they fall short with respect to cost, fabrication, operating temperatures and electronic leakage issues. The ceria co-doped with alkaline earth and rare-earth metal oxides emerged as prospective electrolytes materials for IT-SOFCs [1]. La and Ca co-doped CeO_2 nanomaterial, having composition of $Ce_{0.9}La_{0.1}Ca_{0.1}O_2$ (LCDC20), is prepared by a cost-effective auto-combustion method using metal nitrates as oxidants and citric acid as fuel, studied here as electrolyte material.

The obtained LCDC20 was calcinated, pelletized (10 2 mm dimensions) and sintered at 1200 ^{0}C for 6 h. It was characterized by XRD, FTIR, Raman, XPS, UV-DRS, FESEM-EDX, and ac-impedance. The crystallite size was found to be in the range of 10-30 nm and the band gap is less than 3.33 eV (for pure CeO_2) [2]. Raman spectra shows slight shift of bands towards lower energy level when compared to CeO_2. Based on impedance measurement, LCDC20 showed the ionic conductivity of 1.99 10^2 S cm^{-1} at 1073 K with lower activation energy of 0.92, 0.91, and 0.87 eV for grain, grain boundary and total conduction, respectively [3]. Ionic transference number (t_{ion}) was found to be 0.96 by Wagner's polarization technique. The suppressed Nyquist plots, lower activation energy, higher ionic conductivity and t_{ion} values suggest that LCDC20 is a potential electrolyte for IT-SOFCs.

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PP-22

RECOVERY OF Pt, Pd AND CeO$_2$ FROM SPENT AUTO CATALYTIC CONVERTER THROUGH ECO-FRIENDLY HYDROMETALLURGICAL APPROACH

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The high demand of platinum group metals (PGMs) is due to their least abundance in earth crust and potential catalytic property. The spent auto catalytic converter (SACC) is regarded as the important secondary metal resource of PGMs as well as cerium [1,2]. This study is focussed on the recovery of PGMs and Ce from SACC by hydrometallurgical approach. The SACC is characterized using XRF, XRD, IR. The concertation of metals in the leachate were analysed by using ICP-AES. Finely ground SACC powder was roasted with NaOH followed by water leaching [3]. This results in the conversion of insoluble SACC into soluble sodium aluminate. The base metals such as Al, Mg, Si, Fe, were leached out in water. The residue obtained in first step was leached using mild organic acids (malic acid, picolinic acid and succinic acid). The highest leaching efficiency was achieved in 0.1 M malic acid at 80 °C in 12 h with a solid to liquid ratio of 50 g/L. The extraction efficiency of Pt and Pd reached 70% and 75%, respectively. The minor quantity of base metals was also leached during this step (<5%). CeO$_2$ was enriched in the residual solid. Thus, mild organic acid leaching by hydrometallurgical method seems to be economical and environmentally benign towards circular economy and sustainable development.

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Fig 1. Flow chart for the experimental procedure.

PP-23

TRACING THE ORIGIN OF DISSOLVED ORGANIC MATTER IN THE NATURAL WATERS USING ^{13}C ENVIRONMENTAL ISOTOPE

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Dissolved Organic Matter (DOM) is a complex mixture of aliphatic and aromatic hydrocarbons consist of functional groups like carbonyl, phenyl, sulfide, amide, hydroxyl. Chemical structure of the DOM varies with the time and space due to variations in temperature, microbial degradation, interactions with sediment and soils [1]. Natural sources such as plant litter, leachates, algae, biomass, etc are precursors for the DOM. In the aquatic world DOM plays a pivotal role as the most basic source of nutrient and energy for the living organisms of a given food web. On the contrary, release of domestic, industrial, agricultural wastes into surface water sources are responsible for degrading the water quality and resulting into high concentration of DOM. Disinfectants like chlorine bind with DOM to form disinfectant by-products (DBP) like trichloromethane and trichloroacetic acid, which are harmful.

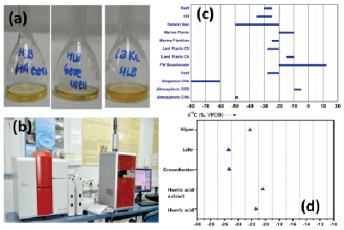

Fig: 1 (a) Extracted DOM samples, (b) EA - IRMS, (c) Ranges of DOM sources and (d) δ^{13}C values of measured water samples

In this research work, solid phase extraction (SPE) technique was adopted to separate the DOM from lake (S1) and groundwater (S2) samples to assess sources of DOM. In addition, algae samples were also collected and measured for ^{13}C to identify its relation with DOM in the tested water samples. The water samples (S1 and S2) were filtered through 0.45micron filter and acidified using pure concentrated HCl (37%). The final pH of the acidified samples was adjusted to 2 - 2.5. For DOM standard, 10 mg of humic acid (HA) was dissolved in 1 L of water and acidified to pH 2 - 2.5. About 1 L of HA standard, S1 and S2 were passed through the commercially available SPE cartridges (Inertsep HLB FF 1mg/6mL). The extracted DOM was eluted using 4ml of pure methanol and dried using a rota- vapor (60°C) (fig 1a). Dried extracts were measured for ^{13}C using Elemental Analyzer - Isotope Ratio Mass Spectrometer (EA - IRMS) (fig 1b). In addition, pure HA (in solid form) and algae were also measured for ^{13}C. Results indicate that ^{13}C values of all the samples range from -25.41 to -20.37 ‰ (fig 1d). Both lake and groundwater samples showed values of -25.41‰ and -25.32 ‰ respectively, different from algae value of -22.25 ‰. This suggest that DOM is possibly derived from plant C3 (-30 ‰ to -25 ‰) but not by algae (fig 1c).

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PP-24

AN APPROACH TO REMOVE THE RHODAMINE-B FROM AQUEOUS MEDIA USING COST EFFECTIVE NATURAL SORBENT

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Rhodamine-B (Rh-B) is a synthesized organic dye used for colouring food & cloth and also sometimes as a tracer to determine the flow direction of water. Its direct release in aquatic ecosystem leads to several health hazards. Rh-B is the carcinogenic and toxic dye for human as well as aquatic plants, it inhibits essential biological events (fig 1b) [1]. Mango leaves (scientific name: Mangifera Indica) are the most abundant, easily accessible and a waste material in the environment until it gets fully degraded. These leaves can work as a sorbent in sorption of dyes and it can be alternative for the other expensive sorbent materials. In this study, sorption of Rh-B on mango leaves as a sorbent was performed, to find the sorption efficiency of the mango leaves.

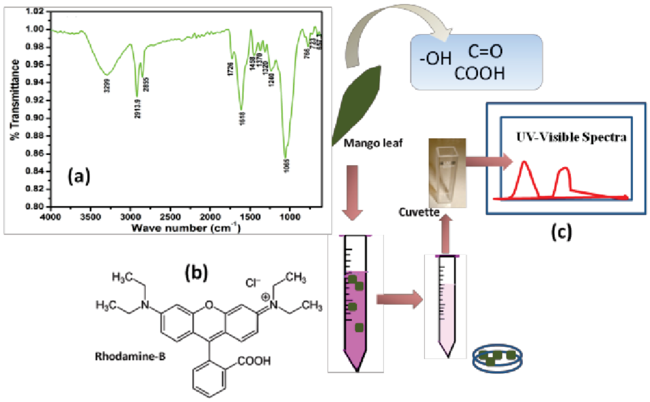

Fig: 1(a) IR spectra of mango leaves, (b) chemical structure of Rh-B and (c) sorption study

Mango leaves washed with millipore water and dried was characterized using IR-spectroscopy to confirm the presence of phenolic OH groups. The amount of dye in solution after equilibration was measured using UV-Vis spectroscopy (fig 1c). The amount of sorbent required for maximum uptake was evaluated in the range of 0.05-0.15g using a 2ppm dye solution equilibrated for 1h at pH 6. The pH value 6 was maintained on the basis of previous studies [2]. It was seen that sorption was increased then attained saturation at 0.15g of sorbent. It was seen that under optimized conditions, the sorption was around 80 %. The calculated experimental capacity for Rh-B was found to be 13.73 mg/g. The OH groups could bind with the cationic dye (fig 1a). Thus, dried mango leaves seem to be potential eco-friendly sorbents for dyes.

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PP-25

BAMBOO WASTE PYROLYSIS FOR SUSTAINABLE GREEN CHEMISTRY: A NOVEL APPROACH TOWARDS ECO-FRIENDLY PRODUCT DEVELOPMENT

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This poster presentation involves a review on bamboo waste pyrolysis in a Sustainable green chemistry approach. Bamboo biomass is a potential feedstock for pyrolysis where it is thermochemically degraded and transformed into valuable bioproducts. This review discusses the recent improvement in bamboo pyrolysis technology and emphasizes how it will produce syngas, bio-oil, and biochar. Bamboo biomass is a potential feedstock for pyrolysis because of its abundance and quick growth.

This review goes beyond the technical details to explore the environmental and economic effects of bamboo pyrolysis. The bamboo pyrolysis process can be environmentally friendly and can offer viable options for producing/synthesizing chemicals while also providing a means of reducing environmental impacts. This study focuses on a review of literature on bamboo pyrolysis where it has been employed to produce eco-friendly products and showcasing its potential for applications in various industries. The key points included in the presentation are the optimization of pyrolysis conditions, resultant pyrolyzed bio-product characterizations, and incorporation of bamboo pyrolysis into the circular economic framework. In addition, this review explores upcoming challenges and futuristic direction for research, which leads to the need for cooperative efforts to further advance in this novel approach.

The awareness gained from this study contributes to the ongoing efforts of communication surrounding the transition towards a more sustainable and circular economy.

PP-26

SYNTHESIS, CHARACTERIZATION AND APPLICATION OF SILVER LOADED BIOCHAR IN CATALYTIC REDUCTION OF PARA-NITROPHENOL

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p-nitrophenol (PNP) is a common aromatic molecule that is widely employed in the manufacturing of specialty and fine chemicals, including petrochemicals, pharmaceuticals, and insecticides and is a refractory pollutant that is extremely harmful to the environment and is categorized as a priority pollution. Low PNP concentrations for an extended period of time can have major health effects in humans, including methemoglobinemia, liver and kidney damage, and other illnesses. Catalytic reduction of such compounds helps remediate the wastewaters effectively. For efficient catalysis a simple, economical and environmentally beneficial method has been followed to fabricate two silver-loaded biochar nanocomposites prepared by doping silver in biochar made from sweet potato pulp (AgBiOC) and sweet potato peel (AgBiOCPS). The synthesis of AgBiOC and AgBiOCPS has been outlined in the graphical abstract below and were characterized by various techniques such as FTIR, UV, XPS, SEM, TGA and BET. The FTIR spectra showed prominent peaks at 3200 cm^{-1} which can be attributed to the cellulosic O-H stretching, at 1691 cm^{-1} which corresponded to the C=C stretching of the aromatic bending of the C-H group and the peaks of Ag-O between 900-600 cm^{-1}. The TGA results also reveal that the catalyst is stable and not much weight loss is observed. The XPS results were useful for finding the amount of silver doped in the biochar. AgBiOC and AgBioCPS effectively catalyzed the reduction of p-nitrophenol. The reduction studies were optimised by varying the parameters such as amount of catalyst and amount of $NaBH_4$.

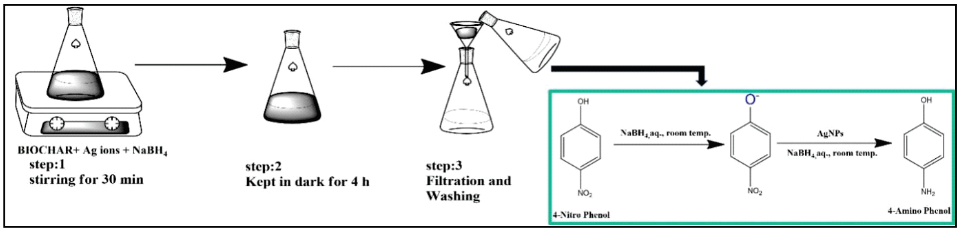

Fig 1: Synthesis of Silver loaded biochar

Keywords: refractory pollutant; catalysis; nanocomposites; biochar; remediate; p-nitrophenol

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PP-27

BIOCHAR FOR HEAVY METAL DECONTAMINATION: A SUSTAINABLE SOLUTION FOR POLLUTED WATER

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The ever-increasing presence of heavy hazardous metals (HHMs) in water bodies poses a significant threat to human health and aquatic ecosystems. Conventional treatment methods for HHM removal often face limitations like high cost, low efficiency, and generation of secondary pollutants. Biochar, a carbon-rich material produced from biomass pyrolysis, has emerged as a promising and sustainable alternative for HHM decontamination. This poster presentation will shed light on the latest advancements in biochar utilization for HHM removal, focusing on:

- Enhanced Adsorption Capacity: We will explore the influence of biochar properties (surface area, porosity, functional groups) on HHM adsorption efficiency. Strategies for tailoring biochar properties through feedstock selection, pyrolysis conditions, and activation techniques will be discussed.
- Mechanism of HHM Removal: An in-depth look at the primary mechanisms involved in HHM adsorption onto biochar, including physical adsorption, complexation, and ion exchange, will be provided. Recent findings on the role of surface chemistry and the impact of environmental factors like pH and ionic strength will be presented.
- Comparative Analysis: We will compare the performance of biochar with conventional HHM removal methods in terms of cost, efficiency, and environmental impact. The potential drawbacks and challenges associated with biochar application, such as regeneration and disposal, will be addressed.

Key Takeaways:

- Biochar offers a viable and eco-friendly alternative for HHM removal from polluted water.
- Tailoring biochar properties and understanding adsorption mechanisms are critical for optimizing performance.
- Comparative analysis reveals biochar's potential competitiveness over traditional methods.
- Addressing challenges and exploring future research directions are crucial for wider biochar adoption.

This poster presentation aims to engage researchers in a discussion about the exciting potential of biochar as a sustainable solution for HHM-contaminated water remediation.

PP-28

IONIC LIQUID ENTANGLED SULFONIC ACID FUNCTIONALISED PORPHYRIN PHOTOCATALYST FOR CONTROLLING WATER POLLUTION BY DEGRADATION OF METHYL ORANGE DYE

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Ionic liquid entangled sulfonic acid functionalised porphyrin photocatalyst was synthesized and confirmed by Fourier transform nuclear magnetic resonance (FT-NMR) and Fourier transform infrared spectroscopy (FTIR). The energy band gap and Hammett acidity were determined by UV-Vis. Spectrophotometer. The recyclable porphyrin photocatalyst demonstrated high efficiency for degradation of methyl orange (MO), in presence oxygen/hydrogen peroxide under irradiation of 5 W LED light in home-made photoreactor at room temperature. The concentration of the MO was determined by UV–visible spectroscopy, and the decomposition of the dye was supported by GC–MS analysis. The optimal degradation of MO was attained by charging 20 mg catalyst in 10h in the presence of air/H_2O_2. The degradation of MO was accomplished by the reactive species under photocatalytic conditions. The reactive species like superoxide anion radical, hydroxyl radical, hydroperoxyl radical, singlet oxygen was identified by various scavengers. The reusable porphyrin indicated admirable photocatalytic activity without using any additives during degradation. Hence, this method is appropriate for the decomposition of MO from the water under optimized photocatalytic reaction conditions. The stability of porphyrin photocatalyst was confirmed by NMR after 5th consecutive run, matching the same number of protons as fresh catalyst. The intermediate fragments of MO were endorsed by GCMS analysis.

PP-29

EFFECT OF BIOCHAR AND GREEN MANURE ON SOIL FERTILITY

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Background: Biochar is an extensively used adsorbent because of its huge specific surface area, exceptional porosity, large cation exchange capacity, and numerous functional groups. Biochar has been researched as soil amendment for nutrient retention and carbon sequestration as it is need of the hour due to the ongoing degradation of the soil environment. Addition of organic matter like biochar and green manure, may be a helpful tactic to enhance the physical characteristics of the soil, soil fertility and boost crop production while maintaining or increasing the organic matter content of the soil in a sustainable manner.

Objective: To optimize the amounts of biochar and observe its synergistic effect with *Peltophorum pterocarpum* leaves used as green manure

Methodology: The study investigated the effects of single and combined application of wood biochar with green manure on soil properties, which were tested along with control for soil fertility indicators such as pH, Electrical conductivity, Bulk density, Soil organic matter, Soil organic carbon, Water holding capacity, Moisture content, Ash content following standard set procedures.

Results The soils that received mixed green manure and biochar treatments showed higher values in soil fertility indicators, although the pH was not significantly affected. In addition to lowering ash content by 32% and bulk density by 50%, the treatment of soil with 20% green manure and 10% biochar exhibited significantly higher values, improving soil organic matter by 35%, soil organic carbon by 20%, and water holding capacity by 36% when compared to the problem soil. This demonstrates the green manure and biochar treatment has successfully improved the soil quality of the problem soil. The outcomes demonstrated a beneficial synergistic impact when biochar and green manure were treated in a 1:2 ratio.

Conclusion: Biochar showed synergistically positive influence on soil properties when combined with green manure in the ratio 1:2 which could be further confirmed by its effect on the crop yield.

Keywords: Biochar; green manure; soil amendment.

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PP-30

APPLICATION OF ACTIVATED BIOCHAR FOR PESTICIDE ADSORPTION

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Biochar is a high-carbon material that can be produced by pyrolysis. In the present study, biochar has been prepared from dry twigs of Jamun (*Syzygium cumini)* and Neem (*Azadirachta indica*) as precursors. Alkali activation was used for preparation of activated carbon from the biochar. The activated carbon was characterised for CHNS content, functional groups using FTIR and surface morphology using SEM.

The application of the prepared carbon for adsorption of pesticides was studied. Persistent organochlorine pesticides were removed from water using the prepared carbon. The study focused on the adsorption of Alpha-HCH, Beta-HCH, Gamma-HCH, Aldrin, pp-DDE with varying the pesticide spike concentration between 0.5 ppb to 10 ppb; varying the amount of adsorbent (Activated Carbon) on pesticide-spiked water samples, i.e.,5 mg to 15 mg; and the pH variation in the range of acidic (pH 5), neutral (pH 7), and basic (pH 9) to investigate the adsorption .

An adsorption of 48.5% -78.7% was achieved for the carbon prepared from Jamun twigs and 38.8% to 89.6% was achieved for the carbon prepared from Neem twigs. Maximum adsorption was obtained at pH 7, 15 mg of adsorbent, and 0.5 ppb of spike concentration. The activated Jamun biochar was more effective for pesticide removal through adsorption.

PP-31

TOWARDS SUSTAINABLE COOKING: ANALYSING TRADITIONAL VS LOW COST IMPROVED COOKSTOVES PERFORMANCE USING ISO 19869:2019 GUIDELINES

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Reliance on solid fuels to address energy demands, like cooking, is evident in developing countries like India. Additionally, traditional cookstoves (TS) for cooking and boiling water are used in several rural settlements of the nation. The use of solid biomass in such inconsiderately designed, less efficient cookstoves significantly contributes to household air pollution, leading to severe health problems, especially among women and children. The present study aims to compare a mud-based TS performance evaluation with its improved counterpart. Both cookstoves were assessed for emissions (PM2.5 and CO) and efficiency using the established guidelines of ISO 19869:2019 cookstove field testing protocol. The results of the improved cookstove depicted significant emission reduction and increased combustion efficacy with prolonged periods in pure flaming conditions when compared to its conventional alternative. The outcome of the study also highlighted the cost-effectiveness of our designed IC, 4–6 times cheaper than metal-based ICs, having the potential to outperform various rudimentary clay-based ICs (in terms of PM2.5 and CO) and on par with some metal-based ICS (in terms of PM2.5 emissions). Moreover, the study also discusses user perception through qualitative surveys to comprehend IC's community acceptability and highlights the potential and role of awareness programs for increasing adoption rates to maximize health and climate benefits.

Keywords: Improved Cookstoves, Emissions, Household air pollution, Thermal Efficiency

PP-32

PAHs CONCENTRATION IN THE GROUND WATER AQUIFER OF VILLAGES IN VICINITY OF MSW LANDFILL SITE

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The study focus on the determination of PAHs in the ground water of the landfill sites along with the villages in the vicinity (5 KM radius) of the MSW Landfill sites. Leachate samples from the landfill site and ground water samples of landfill site & its surrounding villages (3 villages) were analysed for its organic contamination mainly 13 Polycyclic Aromatic Hydrocarbons (PAHs), its concentration and trends of PAHs movement in the ground water aquifers of the villages [1].

The results of the studies was of concern as the ground water is used for domestic as well as potable purposes by the village population. The leachate was loaded with high concentration of all the PAHs. Considerable high concentration of PAHs was found in the ground water of MSW landfill site which was ranging from 0.04(Benzo[a]pyrene) to 4.293(Phenanthrene) µg/L [2]. On the other hand the total PAHs concentration was considerably high in the village which is nearer to the landfill site (min. 0.131 µg/L of Dibenz (a, h) anthracene & max 3.488 µg/L of Phenanthrene). The remaining 2 villages that are little far from the landfill site also showed considerable amount of PAHs concentrations which ranges from 0.02 µg/L of Benzo[k]fluoranthene to 1.575 µg/L of Phenanthrene.

Although the BIS limits of total PAHs is 0.1 µg/L for drinking water whereas the samples showed much higher values which are of great concern as some PAHs have mutagenic and/or carcinogenic properties. Also the acute & chronic impacts of these organic contamination can lead to skin irritation, inflammation, decreased immune function, cataracts, kidney and liver damage (e.g. jaundice), that were observed in the village population [3].

Keywords: Polycyclic Aromatic Hydrocarbons (PAHs), ground water contamination, chronic & acute impact.

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PP-33

CITRUS WASTE VALORIZATION TO DESIGN NUTRACEUTICAL RESOURCE BY MOLECULAR IMPRINTING

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Nagpur is the third-largest city of Maharashtra state and is known as the orange city for the best quality mandarins in India. Citrus fruit produces ~ 7.8 million tons of citrus waste per year in India. The sustainable valorization of these inexpensive agro-industrial citrus wastes, which has abundant polyphenolic antioxidants can be used for plant-derived nutraceutical applications not only to benefit environmental but to also comply with the sustainable practices [1].

In this regard, molecular imprinting technique was explored for the selective recovery of Hesperidin from the citrus waste pomace extract using Deep Eutectic Solvents (DES) for the development of nutraceutical resource [2].

Molecularly Imprinted Polymers were used for hesperidin recovery preceded by the DES extraction method. Three DES i.e. Choline chloride: Acetic acid (1:1), Lactic acid: Glucose (5:1), L-proline: Malic acid (1:1), and one Benchmark solvent (Ethanol: water-1:1) were selected. The extraction efficiency of DES was optimized for time, temperature, solid/liquid ratio, and water content. The polyphenolic antioxidant extraction efficiency was compared in terms of total phenolic content and antioxidant capacity such as total flavonoid content, ABTS, DPPH, and FRAP and antimicrobial analysis (Fig. 1).

Among all the tested DES the L-proline: Malic acid DES was found best, proven by the total phenolic content concentration and antioxidant capacity studies. The variable conditions such as temperature: 60 °C, time: 120 min., solid liquid ratio: 1:30 g/mL, and water content: 30% were optimized best for optimal extraction of targeted bioactive polyphenols in L-proline: Malic acid DES.

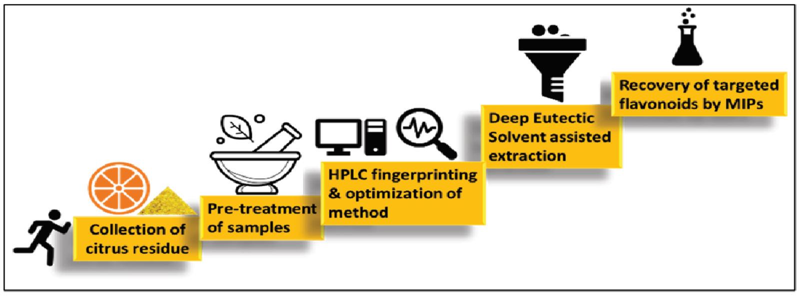

Fig. 1. Graphical Illustration of the work

Keywords: Molecularly imprinting technique; Deep Eutectic Solvents; Green Extraction; Green Chemistry.

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PP-34

PYROLYSIS OF INDUSTRIAL WASTE LIGNIN INTO VALUE-ADDED FUEL PRODUCTS

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Lignin with alkaline metal oxide catalyst has been used for catalytic fixed bed fast pyrolysis reaction of lignin was performed. The effect of the reaction temperature and different weight percentage loading of metal oxide on the catalyst was examined for the product distribution and quality of bio-oil obtained from lignin. The metal oxide shows significant changes in the high-temperature catalytic co-pyrolysis reaction with lignin. The maximum bio-oil yield was obtained at 550 °C under an inert atmosphere. Further increasing the reaction temperature of pyrolysis reduces the yield of bio-oil. Compared with the non-catalytic pyrolysis reaction of lignin, the catalytic pyrolysis reaction shows high bio-oil yield and aromaticity. The reaction mechanism of acidic and basic sites of catalytic pyrolysis reaction with lignin represents the deoxygenated compounds into phenols and aromatic hydrocarbons. This study illustrates the importance of catalyst over the pyrolysis of lignin and increases the fragmentation and aromaticity of hydrocarbon yield.

Keywords: Lignin, Pyrolysis, catalyst, Bio-oil, deoxygenated aromatics.

PP-35

TRACING THE ORIGIN OF DISSOLVED ORGANIC MATTER IN THE NATURAL WATERS USING ${}^{13}C$ ENVIRONMENTAL ISOTOPE

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Dissolved Organic Matter (DOM) is a complex mixture of aliphatic and aromatic hydrocarbons consist of functional groups like carbonyl, phenyl, sulfide, amide, hydroxyl. Chemical structure of the DOM varies with the time and space due to variations in temperature, microbial degradation, interactions with sediment and soils [1]. Natural sources such as plant litter, leachates, algae, biomass, etc are precursors for the DOM. In the aquatic world DOM plays a pivotal role as the most basic source of nutrient and energy for the living organisms of a given food web. On the contrary, release of domestic, industrial, agricultural wastes into surface water sources are responsible for degrading the water quality and resulting into high concentration of DOM. Disinfectants like chlorine bind with DOM to form disinfectant by-products (DBP) like trichloromethane and trichloroacetic acid, which are harmful.

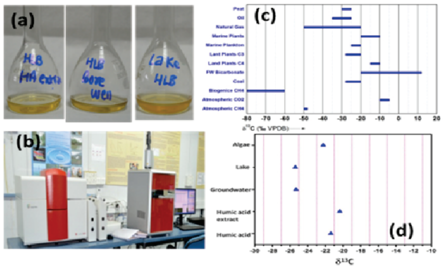

Fig: 1(a) Extracted DOM samples, (b) EA-IRMS, (c) Ranges of DOM sources and (d) ${}^{13}C$ values of measured water samples

In this research work, solid phase extraction (SPE) technique was adopted to separate the DOM from lake (S1) and groundwater (S2) samples to assess sources of DOM. In addition, algae samples were also collected and measured for ${}^{13}C$ to identify its relation with DOM in the tested water samples. The water samples (S1 and S2) were filtered through 0.45micron filter and acidified using pure concentrated HCl (37%). The final pH of the acidified samples was adjusted to 2 - 2.5. For DOM standard, 10 mg of humic acid (HA) was dissolved in 1 L of water and acidified to pH 2 - 2.5. About 1 L of HA standard, S1 and S2 were passed through the commercially available SPE cartridges (Inertsep HLB FF 1mg/6mL). The extracted DOM was eluted using 4ml of pure methanol and dried using a rota- vapor (60°C) (fig 1a). Dried extracts were measured for ${}^{13}C$ using Elemental Analyzer - Isotope Ratio Mass Spectrometer (EA - IRMS) (fig 1b). In addition, pure HA (in solid form) and algae were also measured for ${}^{13}C$. Results indicate that ${}^{13}C$ values of all the samples range from -25.41 to -20.37 ‰ (fig 1d). Both lake and groundwater samples showed values of -25.41‰ and -25.32 ‰ respectively, different from algae value of -22.25 ‰. This suggest that DOM is possibly derived from plant C3 (-30 ‰ to -25 ‰) but not by algae (fig 1c).

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PP-36

MACHINE LEARNING CALIBRATION OF LOW-COST AIR QUALITY SENSORS FOR ENHANCED PRECISION

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This study explores low-cost air quality monitoring, focusing on low-cost sensors for real-time particulate matter (PM) measurement. Employing machine learning, we calibrated low-cost sensor data against reference-grade data. The low-cost sensor, calibrated for $PM_{2.5}$ and PM_{10}, incorporates temperature and relative humidity for enhanced accuracy. Parameters include one parameter, 4 parameters (including temperature and RH), 6 parameters (including periodic predictors for an hour of the day), and 27 parameters for short-term data spanning approximately 15 days.

Contrary to expectations, Linear Regression exhibited an increasing Root Mean Square Error with additional parameters, indicating potential overfitting. In contrast, XGBoost, particularly the 6-parameter model, outperformed Linear Regression and Random Forest, challenging conventional views on model complexity benefits.

Evaluation using R and RMSE values highlighted the superiority of the XGBoost 6-parameter model in predicting PM concentrations. This study underscores nuanced considerations of model complexity and redefines established paradigms, offering insights into the applicability of machine learning in advanced air quality research. Future work aims at an in-depth sensor analysis in environmental parameters and Air Quality Index estimation, promising refinements in predictive models for environmental sensing applications.

Keywords: Machine Learning, Air Quality Monitoring, Low-Cost Sensors, Prana Air, Calibration, XGBoost;

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PP-37

UV SPECTROPHOTOMETRIC METHOD FOR QUANTITATIVE DETERMINATION OF DORAVIRINE IN BULK AND TABLET FORMULATION

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A novel, simple and economical UV Spectrophotometric method for the estimation of the antiviral drug Doravirine was developed and validated. In the present work study, the main objective is to obtain consistent, reliable and accurate data and the results from method validation can be used to judge the quality, reliability and consistency of analytical results. An estimation of Doravirine and tablet formulation was carried out by UV Spectrophotometric method. The drug showed a wavelength of maximum absorption at 321 nm and the solvent used was methanol. Beer-Lambert law was obeyed in the concentration range of 2-10µg/ml. The calibration curve shows a linear relationship. The regression equation y = 0.0045x + 0.006 with a correlation coefficient (r2) of 0.9994 was obtained. The results of the analyses were validated statistically and the method was validated as per ICH Q2(R1) guidelines. The percentage recovery was found to be in the range of 97.7% to 102.5 %. The proposed method is a simple, accurate and cost-efficient spectrophotometric method that has been developed for the estimation of Doravirine in bulk and laboratory prepared tablets.

Keywords: Doravirine, UV Spectrophotometric method, Recovery, Accuracy, Precision

PP-38

DETERMINATIN OF PLANT PIGMENTS (ASTAXANTHIN, RETINOL & B-CAROTENE) IN BIO-SAMPLES BY HPLC-UV TECHNIQUE

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A new method was developed for the separation and estimation of Astaxanthin, Retinol & B-carotene in biological samples solution by HPLC-UV technique. These are industrially important compounds used in Pharmaceutical and Neutraceutical formulations and a bioprocess is being developed. Desired separation was achieved within 10 min using mixture of acetone and methanol as mobile phase in ratio of 70:30 on Dionex C18 Column (250x4.6mm, particle size 5 μ) at 30 °C. Calibration curves for all the components such as Astaxanthin, Retinol & B-carotene in the concentration range of 10-100 ppm were plotted and it was observed that the correlation coefficient (R^2) lies in between 0.993 and 1.0. Relative standard deviation (RSD) observed for all the above mentioned plant pigment were in the range of 6.4-8.4 %. The order of elution of above molecules are like this Astaxanthin first, then Retinol and at last B-carotene eluted from the column. Biological sample solution (as such) is injected into the injector of HPLC system for analysis & detected at 320 & 460nm using UV-Visible detector. Astaxanthin and B-carotene were found in the samples in the range of 10-1500 ppm. The major peak in the samples is identified as Astaxanthin. The operational simplicity of this method in terms of accuracy and precision can be a good method for the estimation of above molecules in plant derived biological samples.

Keyword: HPLC, Plant pigment, Reverse phase, PDA Detector etc.

PP-39

EXPLORING THE THERMOACOUSTIC AND VOLUMETRIC BEHAVIOUR OF BIOGENIC POLYAMINES: IMPLICATIONS FOR DRUG DELIVERY AND BEYOND

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Biogenic polyamines, vital within eukaryotic and prokaryotic cells, are recognised for their indispensable roles in cellular regulatory pathways, impacting fundamental processes such as DNA, RNA, and protein synthesis, cell proliferation, and immune function. Despite their potential as anti-proliferative agents in tumour cell lines and markers for cancer chemotherapy, the precise mechanisms underlying their biochemical actions remain elusive.

In account of this, the current research delved into the thermodynamic and acoustic properties of three biologically relevant polyamines viz. Putrescine dihydrochloride, Cadaverine dihydrochloride, and Tryptamine hydrochloride, across a range of seven different temperatures (*T*=288.15-318.15 K) encompassing the human body's span. Through experimental determination of density and speed of sound, crucial thermodynamic parameters were computed, shedding light on the physiochemical behavior of these polyamines in the aqueous environment. Notably, parameters like apparent molar volume of solute(V_ϕ), limiting apparent molar volume of solute(V_ϕ^{o}), isentropic compressibility of solution (K_s), apparent molar isentropic compression of the solute ($K_{s,\phi}$), limiting apparent molar isentropic compressibility of solute ($K_{s\ \phi}^{o}$), apparent molar expansibility of solute (E_ϕ^{o}), coefficient of thermal expansion (α*), second order derivative of limiting apparent molar volume ($\partial^2 V_\phi^0 / \partial T^2$) and hydration number (n_H) were scrutinized. .

PP-40

THERMOPHYSICAL PROPERTIES OF PYRIDINIUM-BASED IONIC LIQUID IN AQUEOUS AND IN AQUEOUS AMINO ACIDS SOLUTIONS AT VARIOUS TEMPERATURES

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Ionic liquids (ILs) have been widely acknowledged in recent years as sustainable and promising green solvent and exhibit several characteristics which makes them applicable for biomedical use. They can be precisely customized to possess desired sets of physicochemical properties that enhances their versatility and effectiveness for biomedical applications. The comprehensive investigation of thermodynamic and compressibility properties of IL in aqueous amino-acids solutions forms important in building novel and creative biomedical products and forms basis in understanding of the complex molecular-level biological process. In this context, the simultaneous measurement of the thermophysical property chiefly density and ultrasound velocity values for systems comprising of pyridinium-based ionic liquid in aqueous and in aqueous 0.05 and 0.10 m amino acid solution have been performed. The experimental conditions are varied in terms of respective temperature (288.15 to 318.15*K* at 5*K* interval) and have been conducted in a dilute concentration range (0 to 0.15 mol/kg) of IL at atmospheric pressure. The apparent molar volumetric and compressibility property are highly sensitive to variation in experimental temperature, solvent and structure of IL and also holds both practical and theoretical significance. So, in this respect, the calculation of several derived properties are facilitated from the collected density and ultrasound velocity data. In addition, the mechanism of hydration involving the interplay between hydrophobic and hydrophilic components, together with magnitude of the interactions among IL and solvents are key aspects in understanding the behaviour of these systems. Additionally, limiting volumetric and acoustic properties are also evaluated. All the experimental findings have been discussed in terms of interactions among IL and solvent molecules which sheds light on some phenomena in the field of biocompatible IL research.

Keywords: Density, Ionic Liquid, Limiting apparent molar volume and limiting apparent molar compressibility of solute.

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PP-41

THERMOPHYSICAL STUDIES OF SOME DRUGS IN AQUEOUS DEXTROSE AND UREA SOLUTIONS AT *T* = (288.15-318.15) K

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Density and speed of sound values of Creatinine, Ornithine monohydrochloride and L-Citrulline in aqueous solution, 0.06 mol· kg-1 aqueous Urea and aqueous 0.06 mol·kg-1 Dextrose solutions have been measured at *T* = (288.15, 293.15, 298.15, 303.15, 308.15, 313.15 and 318.15) K within the concentration range of (0.02 to 0.2) mol·kg^{-1}. These measurements have been performed to evaluate some important parameters, viz, apparent molar volume of solute (V_ϕ), limiting apparent molar volume of solute (V_ϕ^{o}), limiting apparent molar volume of transfer ($\Delta_{tr}V_\phi^{0}$), apparent molar expansivity (E_ϕ), thermal expansion coefficient, Hepler's constant, isentropic compressibility (K_s), apparent molar compressibility ($K_{s,\phi}$), limiting apparent molar compressibility ($K_{s\ \phi}^{o}$), limiting apparent molar isentropic compressibility of transfer ($\Delta_{tr}K_{s\ ,\phi}^{0}$) and hydration number have been calculated. The results have been interpreted in terms of different interactions taking place in aqueous solutions. Also, the effect of same medium on different drug molecules have been interpreted.

Keywords: Density, Ultrasonic velocity, Apparent molar properties, transfer properties.

PP-42

INTERACTION STUDIES OF CHLORPHENIRAMINE MALEATE IN GLYCINE: A COMPREHENSIVE ANALYSIS USING DENSITY AND SOUND VELOCITY MEASUREMENTS

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This study explores the interactions between Chlorpheniramine Maleate (CPM) and aqueous glycine solution through a multidimensional approach employing density and sound velocity measurements. The interaction of pharmaceutical compounds with excipients is critical for optimizing drug formulations, ensuring stability, and enhancing therapeutic efficacy. In this investigation, the focus is on understanding the molecular interactions between CPM, an antihistamine drug, and glycine, a common pharmaceutical excipient. Density (ρ) and sound velocity (u) for CPM in binary (aqueous) and ternary (0.05 mol.kg^{1} aqueous glycine solution) systems were measured at 298 K over the concentration range of (0.03 to 0.15) mol.kg^{-1}. The thermodynamic parameters such as apparent molar volume of solute(V_{ϕ}), limiting apparent molar volume of solute(V_{ϕ}^{o}), experimental slope (S_{V}), transfer limiting apparent molar volume of solute ($\Delta_{tr}V_{\phi}^{0}$), isentropic compression of solution (K_{s}), apparent molar isentropic compression of solute ($K_{s,\phi}$), partial molar isentropic compression of solute ($K_{s}^{o}{}_{\phi}$), partial molar isentropic compression of transfer of solute ($\Delta_{tr}K_{s}^{0}{}_{,\phi}$) and hepler's constant ($\partial^{2}V_{\phi}^{0}/\partial T^{2}$) are calculated from the experimentally measured ρ and u data. The outcomes are explained in terms of interactions between the solute-solute and solute-solvent in these systems.

PP-43

ELUCIDATING MOLECULAR INTERACTIONS: THERMODYNAMIC AND COMPRESSIBILITY PARAMETERS OF METHYL NICOTINATE IN WATER AND AQUEOUS L-ALANINE SOLUTIONS

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This study delves into the molecular interactions of methyl nicotinate, an organic compound, in both water and aqueous L-alanine solutions. Through a comprehensive analysis of thermodynamic and compressibility parameters, the research aims to elucidate the intricate behaviors and intermolecular forces governing the system. Experimental investigations were employed to assess the impact of L-alanine, an amino acid, on the solvation and molecular interactions of methyl nicotinate in aqueous environments. The thermodynamic properties, including volumetric compressibility parameters, were evaluated to gain insights into the driving forces behind the observed interactions. These findings contribute to a deeper understanding of the solution chemistry involving methyl nicotinate and provide valuable information for applications in pharmaceuticals, biochemistry, and related fields. Taking that into consideration, we measured the densities and speeds of sound for methyl nicotinate in aqueous and in 0.05 $mol.kg^{-1}$ aqueous L-alanine solutions at different temperatures (293.15, 298.15, 303.15, 308.15, and 313.15) K and atmospheric pressure. These experimental results are used to determine apparent molar volume of solute (V_ϕ), apparent molar compressibility of solute ($K_{s\,\phi}^{o}$), limiting apparent molar volume of solute (V_ϕ^{o}), limiting apparent molar compressibility of solute ($K_{s\,\phi}^{o}$), for methyl nicotinate in aqueous and 0.05 $mol.kg^{-1}$ aqueous L-alanine solutions. Transfer partial molar volume ($\Delta_{tr}V_\phi^{0}$),and transfer partial molar compressibility ($\Delta_{tr}K_{s\,,\phi}^{0}$) of methyl nicotinate from water to aqueous L-alanine solution were also computed. The outcome of the study reveals that the affinity between methyl nicotinate and both water and L-alanine increases with temperature. Based on the transfer parameters it has been observed that the ion-hydrophilic/hydrophilic-hydrophilic interactions predominate over other interactions. The consistently positive Hepler's constant values imply that methyl nicotinate behaves cosmotropically in binary and ternary systems.

PP-44

SYNTHESIS, ELECTROCHEMICAL AND BIOLOGICAL ACTIVITY EVALUATION OF NOVEL CURCUMIN DERIVATIVES

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In this work described synthesis of curcumin 3,4-dihydropyrimidinones and curcumin benzodiazepine derivatives by using diversified reactants in the presence of acetic acid under microwave irradiation. The chemical structures of the synthesized compounds were verified based on the spectral and analytical techniques. Some of the selected derivatives were evaluated for their anticancer studies against lung cancer A549 cell lines, and all tested derivatives showed comparable activities with the reference Doxorubicin. Further investigated *in vitro* antioxidant activity of the synthesized derivatives by DPPH method. The result appears that, some compounds possess significant antioxidant properties in comparison to standard ascorbic acid. Furthermore, some of the derivatives were subjected to electrochemical behaviour studies using cyclic voltammetry recorded scan rate of 50 mVs^{-1}. These derivatives showed intensive oxidation and reduction potential properties and emerged as an excellent anti-oxidant agent. These derivatives further planning to take *in vivo*, animal model studies and drug likeness determination in the future.

PP-45

SYNTHESIS, MOLECULAR DOCKING, DRUG LIKELINESS, ELECTROCHEMICAL AND BIOLOGICAL STUDIES OF DIHYDROQUINAZOLINONE DERIVATIVES

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An efficient one-pot Multi-Component Reactions (MCRs) of 2,3-dihydro-4(1*H*)-quinazolinone derivative is achieved by the reaction of isatoic anhydride, aryl aldehyde and substituted aniline in ethanol organocatalyzed Glutamic acid (Glu) under microwave irradiation is described. The established method has number of advantages, including simple, eco-friendly, inexpensive, excellent yield, faster, and simple work-up. The homogeneity of the synthesized quinazolinone derivatives performed by several spectroscopic analyses, and supported the uniformity of the product. Among derivatives synthesized, compounds three (**4m, 4o** and **4r**) are found novel prepared in this work. Further, frontier molecular orbital (FMOs) analysis of the derivatives performed gave a significant energy gap between the highest and the lowest energy-occupied molecular orbital. Molecular docking and dynamics estimated significant binding affinity and stability between the protein and the ligands synthesized. Furthermore MM/PBSA calculation identified key residues that contribute to the binding energy, activity and assessed cytotoxicity. The *in vitro* anticancer evaluation of the synthesized compounds (**4l–4r**) against human ovarian cancer PA-1 cells tested, among them, **4r** and **4m** exhibited activity very close to the reference drug doxorubicin (**3.66 ± 0.07**) with the IC_{50} value **7.53 ± 0.09** and **17.93 ± 0.12**, respectively. Moreover, electrochemical behavior studies for the selected derivatives tested using cyclic voltammetry, compounds **4l, 4m, 4p, 4o,** and **4q** showed strong oxidizing and reducing potential due to the presence of functional group.

PP-46

DESIGN OF PORPHYRIN COMPRISING IONIC LIQUID AND SULFONIC ACID MOIETIES FORTHE GREEN SYNTHESIS N-SUBSTITUTED BENZIMIDAZOLE

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Nitrogen-containing scaffolds are extremely important for fine chemicals, organic materials, natural products, and pharmacological applications. Therefore, the C-N bond formation is highly significant to both industrial domains, fine chemical industries, and researchers. Usually, C-N coupling of aryl halides with heterocyclic compounds is afforded in presence of metal, strong bases, additives, ligands and at high temperatures. These methods have serious drawbacks that required equivalent quantity of metal catalysts and contamination of final products due to leaching of metal during the reaction. As a result, the development of an alternative, reasonable, cost-effective, and environmentally friendly protocol that uses a metal-free, base-free, additive-free photocatalyst is attracted for the C-N coupling. Here, we have presented a porphyrin-based photocatalyst to produce C-N bond formation under photocatalytic reactions in a home-made photoreactor. Porphyrin acquired excellent stability and recyclability in organic transformations and are well-known for their ability to capture light in the visible range. In this protocol, we have performed the reaction of benzimidazole and p-chlorobenzaldehyde as a model reaction for C-N coupling, in a homemade photoreactor fitted with 5W LED light. The protocol tolerates different aryl halides containing both electron-donating and electron-withdrawing groups lead to admirable yield of the products. The porphyrin photocatalyst was stable and recycled upto 6th cycle with substantial decrease in yield of the N-arylated products.

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PP-47

Design and Synthesis of Novel Dihydropyrimidine Derivatives: A Approach Towards Potent Anti-Bacterial Agents

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Background: In the pursuit of developing potent anti-microbial agents, a series of novel dihydropyrimidine derivatives were designed, synthesized, and evaluated for their antimicrobial activities. The rational design of these compounds involved the incorporation of specific structural motifs known for their antimicrobial properties. The synthesis was accomplished through a systematic multi-step approach, utilizing established organic chemistry techniques. **Aim**: In this study, a series of compounds were designed using computational design and lead molecule Dihydropyrimidine Derivatives were synthesized which were further tested as Anti-Bacterial Agents compared with trimethoprim as a standard drug**. Methods**: Molecular docking study of dihydropyrimidine derivatives was carried out by Auto dock vina software novel compounds were synthesized by propargylation reaction of DHPM with propargyl bromide and potassium carbonate and evaluated for antimicrobial activity against gram-positive bacterial strains and gram-negative bacterial strains. The minimum inhibitory concentration was calculated by the tube dilution method. **Result:** Compound 1-(6-methyl-4-(4-nitrophenyl)-2-(prop-2-yn-1-ylthio)-1,4-dihydropyrimidin-5-yl) ethan-1-one (4g) showed excellent antimicrobial activity. **Conclusion:** Dihydropyrimidines represent a novel set of leads for the designing of novel antimicrobial agents.

Keywords: Molecular Docking, Dihydropyrimidine, Antibacterial, Minimum Inhibitory Concentration

PP-48

ZINC-EMBEDDED POROUS ORGANIC FRAMEWORK CATALYZED SYNTHESIS OF 2-PHENYL BENZIMIDAZOLES

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Porous organic framework (POFs) are porous polymers created by a bottom-up technique from molecular building blocks with predetermined geometry and joined by covalent bonds with persistent porosity and highly organized structures. Due to its stability and several uses, including heterogeneous catalysis, porous organic framework (POF) has attracted attention of researchers during the past few years. By incorporating metal ions in the framework increases the catalytic activity of POF. In this context, the zinc has been loaded in a melamine-terephthaldehyde based porous organic framework (MTPOF), and its catalytical activity is successfully examined for the oxidative cyclocondensation of 2-aminobenzenethiol or benzene-1,2-diamine and various aryl aldehydes to afford 2- aryl benzimidazoles and benzimidazoles. For the synthesis of MTPOF, melamine and terepthaldehyde are reacted by incorporating the zinc metal in the framework via solvothermal reaction process. The Characterization of synthesized catalyst was thoroughly done by IR, PXRD, SEM, TGA and BET analysis. The synthesis of benzimidazoles and benzothiazoles is very effectively catalysed by Zn@MTPOF, which can is easily recovered and reused several times without significantly affecting its catalytic activity.

PP-49

SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL ACTIVITIES OF 3-(3-(4-(4-HYDROXYPHENYL)-3,5-DIMETHYL-1,7-DIPHENYL-2,3,6,7-TETRA-HYDRODIPYRAZOLO[3,4-B:4',3'-E]PYRIDIN-8(1H,4H,5H)-YL)PHENYL)-2-(ARYL)THIAZOLIDIN-4-ONE

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A novel series of 3-(3-(4-(4-Hydroxyphenyl)-3,5-Dimethyl-1,7-Diphenyl-2,3,6,7-Tetra-Hydrodipyrazolo[3,4-B:4',3'-E]Pyridin-8(1H,4H,5H)-yl)Phenyl)-2-(aryl)Thiazolidin-4-one has been designed and synthesized. The thiazolidine-4-one derivatives have been fabricated by using different Schiff base molecules having the presence of pyrazole molecule. For the structural elucidation of series of compounds, different analytical and spectroscopic techniques such as elemental analysis, IR spectra, ^{1}H-NMR spectra and mass spectra were used. All the newly synthesized compounds were tested for their anti-bacterial activity studies. It revealed that some of the compounds possesses moderate to good activities as compared to standard drugs.

Keywords: Thiazolidine-4-one; Schiff Base; Spectral Analysis; Pyrazole; Antibacterial Activity.

PP-50

FUROIC FRONTIERS: UNLEASHING THE POWER OF Ru CATALYSTS IN AQUEOUS AEROBIC OXIDATION FOR THE SYNTHESIS OF 2-FUROIC ACID FROM FURFURAL

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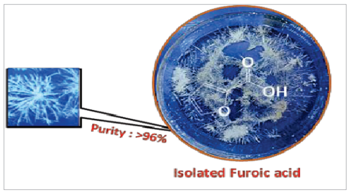
Pentoses are five-carbon sugars derived from biomass, which is an eco-friendly resource. Furfural, a pivotal pentose substrate, has significant commercial production, rapidly expanding its market. However, current industrial practices face yield limitations and require precise temperature control. Research explores novel routes, notably transforming furfural into 2,5-furan dicarboxylic acid (FDCA) through C-H carboxylation, presenting an alternative to traditional methods.[1,2]

Various catalysts, including Pt, Pd, and Ru, supported on materials like carbon, alumina, and mixed oxides (Co, Cu, Mn), are under evaluation for furfural oxidation efficiency. The assessment tackles challenges like catalyst deactivation and environmental impact. The study aims to develop a new, cost-effective, safer method for synthesizing Furfural (FAL), a biomass-derived platform chemical. The approach involves using molecular oxygen and water as solvents and a mild base to enhance yield without compromising pH levels.[3] This can improve large-scale production while reducing costs, making it a more sustainable option.



Isolated Furoic acid (Purity> 96%)

A 5wt% Ru/C catalyst oxidizes furfural (FAL) in water, yielding 83% 2-furoic acid (FURA). Ru demonstrates high activity and recyclability. Optimizing the S/M ratio, minimizing base usage, ensuring efficient catalyst performance, and utilizing concentrated FAL solutions enhance FURA yield. This catalytic system exhibits significant potential for large-scale industrial applications.

Keywords: Biomass; Oxidation; Furfural; 2-furoic acid; Heterogenous Catalysis.

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PP-51

SYNTHESIS AND CHARACTERIZATION OF 1-(2,4-DIHYDROXY-5-NITROPHENYL) -3-P-TOLYLPROPANE-1,3-DIONE AND ITS METAL COMPLEXES

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1-(2,4-dihydroxy-5-nitrophenyl)-3-p-tolylpropane-1,3-dione and its transition metal complexes have been synthesized. The β-diketone ligand is afforded by employing Baker-Venkataraman rearrangement on 4-hydroxy-5-nitro-2--p-tolyl oxyacetophenone. The synthesized compounds were characterized by their physical properties, elemental analyses, IR Spectra, ^{1}H-NMR, mass spectra, electronic and magnetic spectra. The thermal stability and antibacterial activity of the newly synthesized metal complexes have also been studied.

Keywords: β-diketones, metal complexes, thermogravimetric analysis, antibacterial activity.

PP-52

SYNHESIS OF 4H-BENZO[b] PYRAN SCAFFOLDS USING FUNCTIONALISED MONTMORILLONITE CLAY AS AN EFFICIENT SOLID ACID CATALYST

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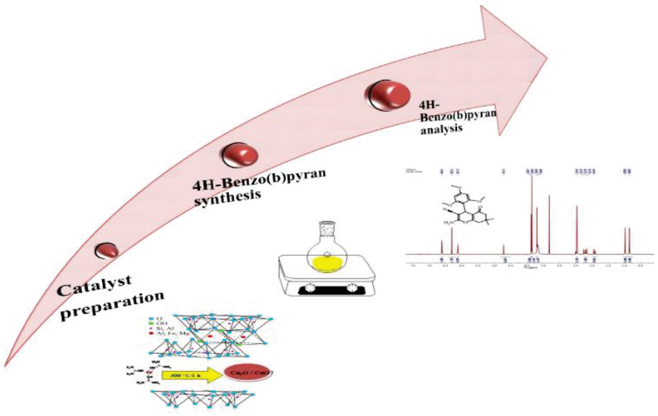
This study presents novel and environmental friendly approach for the synthesis of 4H-benzo [b] pyrans using modified montmorillonite clay (Mt, 2:1 smectite), as heterogeneous solid acid catalyst. The modification of Mt involved the in-situ formation of copper thiourea in the interlayer of Mt through solid state reaction followed by heating at 300 ^{0}C/1 h. The catalyst was characterized by XRD, FT-IR, TG-DTA and SEM-EDX. The cyclo condensation reaction of malonontrile, 1,3-diketone and different aldehydes in presence of catalyst yields 4H-benzo[b]pyran derivatives under optimized reaction conditions [1]. The above heterogeneous catalyst imparts stability, reusability and easy separation. The obtained heterocyclic scaffolds are analysed by ^{1}H-NMR, ^{13}C-NMR, FT-IR and LCMS [2]. Thus, modified clay catalyst here demonstrates robust acid-catalytic functionality, providing an efficient and alternative to mineral acids in organic synthesis [3]. This research represents step forward in the development of eco-friendly synthetic route for production of valuable heterocyclic compounds.



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PP-53

A DEEP COMPREHENSIVE THERMODYNAMIC APPROACH TO THE VOLUMETRIC AND ACOUSTIC PROPERTIES OF AMINO ACID BASED DEEP EUTECTIC SOLVENTS

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Deep eutectic solvents represent a mixture of two or three component that specific properties have low melting point. DES is generally composed of two or three cheap and safe component that are easily combined with each other through hydrogen bond interaction. In DES is prepared by mixing of quaternary ammonium salt with a hydrogen bond donor which have ability to form a hydrogen bond with halide anion of the quaternary salt. DES made up of different component, such as choline chloride, urea, organic acid, and sugar. Despite the advantages of ILs, some aspects challenge their development. One is that some by-products (e.g., water and salt) generate in the preparation process, which is rarely mentioned. Another is related to their biodegradability and bioaccumulation. Consequently, there is increasing focus on their potential influence on theenvironment. As for DESs, their ecological footprint has not yet been thoroughly investigated and few relevant studies have been published. Therefore, the label "green" for DESs should be used with caution and it is essential to determine their biodegradation potential DESs have been used in many fields, such as organic reactions, electrochemical, nanoparticles, and drugs. In these studies, we have developed a series of natural deep eutectic solvents composed of primary metabolites common in living cells, named natural deep eutectic solvents (NADES) they may sometimes include water among their ingredients. The study of the thermodynamic properties of the NDES in the aqueous medium is very central to elucidate the interactions within the solute-solvent and solute-solute components of the system. The physicochemical and thermodynamic investigations are best elucidated in presence of water which makes the detailed understanding of the structure of water essential. Density (ρ), speed of sound (u) of binary solutions of NDES were realised at experimental temperatures T = (288.15 to 313.15) K. The results obtained were used in the computation and treatment of the various thermodynamically important derived parameters to draw a vivid picture of the molecular exchanges present in the system.

Keywords: Deep Eutectic Solvents; Volumetric; Thermodynamic; Kosmotropic; Compressibility.

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ROLE OF LINEAR ALIPHATIC BIOPOLYESTERS IN SCAFFOLD: A REVIEW

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Linear biodegradable polyesters serve very important role as a biomaterials in tissue engineering and regeneration. Tissue engineering aims to create functional and viable biological substitutes to repair or replace damaged tissues. These biodegradable polyesters exhibit excellent properties such as bio compatibility, biodegradability, tunable mechanical properties and versatility in processing. These properties make them valuable components in the development of scaffolds and implants for various tissue engineering applications. The scaffolds used in either tissue engineering or regeneration are to provide support for cellular attachment and subsequent controlled proliferation into a predefined shape or form.

The use of biodegradable polymers as the temporary scaffolds either to grow cells/tissues in vitro for tissue engineering applications or to regenerate tissues in vivo has very recently become a highly important. Scaffolds have been used for tissue engineering such as bone, cartilage, ligament, skin, vascular tissues, neural tissues, and skeletal muscle and as vehicle for the controlled delivery of drugs, proteins, and DNA. A biodegradable scaffold would be preferred because of the elimination of chronic foreign body reaction and the generation of additional volume for regenerated tissues.

In this review paper, we are focusing about the use of different types of scaffolds made up of biodegradable polyester and their applications in the biomedical Implants, wound healing, tissue engineering and regenerative medicine, drug delivery Systems.

Keywords: Scaffold, Biodegradable, drug delivery, bio compatible.

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PP-55

GENETICALLY MODIFIED MOSQUITOES: A REVIEW OF ADVANCEMENT AND IMPLICATIONS

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Vector-borne diseases (VBD) spreading widely across tropical and subtropical regions globally, there is a critical need on global scale for efficient strategies to manage the mosquitoes responsible for transmitting VBD. More than 17% of infectious diseases worldwide are attributed to Vector-borne diseases (Maleria, Dengue, Chikungunya fever, Zika virus, Yellow fever, Japanese encephalitis) resulting in over 700000 annual fatalities. The latest breakthroughs in genetic engineering now enable the development of mosquitoes with diminished vector competence, restricting their capacity to acquire and transmit pathogens. In this context, we present Genetically Modified Mosquitoes (GMMs) that have been synthetically engineered to hinder their vector competence for VBD. The core concept driving the genetic manipulation of mosquitoes is the systematic regulation of their populations by disrupting their reproductive processes. Gene drive technology, aiming for mosquitoes to selectively inherit specific genes rather than adhering to Mendelian genetic principles, serves as the ultimate outcome. The ecological risks associated with the spread of modified genes within mosquito populations are also examined, along with strategies to minimize gene flow and maintain control over released strains. Public perception and concern regarding the release of GMMs underscore the importance of effective risk communication and community engagement to ensure informed decision-making and acceptance of this technology. The potential future applications of GMMs, such as targeted population suppression and disease eradication programs, highlight their significance. To shed light on the regulatory frameworks and ethical considerations that governs the deployment of genetically modified organisms in the field. This comprehensive review paper provides a critical analysis of the advancements made in genetically modified mosquitoes and their implications for disease control and ecological balance. By understanding the potential benefits and risks associated with this technology, we aim to foster informed discussions and responsible decision-making in the field of vector-borne disease management.

Keywords: Genetically Modified Mosquitoes (GMMs); Vector-borne diseases (VBD); Gene drive technology; Mendelian genetics; Vector competence

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PP-56

ASSOCIATION OF OCCUPATIONAL HAZARDS WITH SKIN CANCER: A REVIEW

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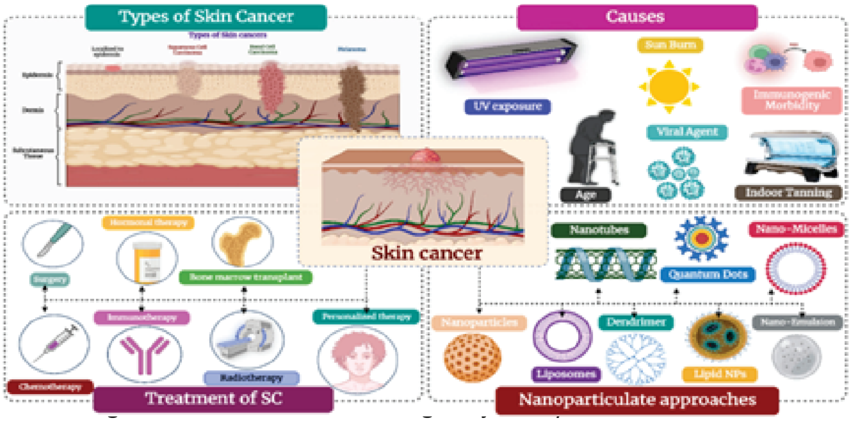
Skin cancer is the uncontrolled growth of abnormal skin cells. Basal cell carcinoma, Squamous cell carcinoma, Melanoma and Merkel cell cancer represent various forms of skin cancer. This concise review examines the relationship among the occupational hazards as well as the heightened hazard of skin malignancy among various working populations. Ultraviolet (UV) radiation is a well-known contributor to skin cancer but different studies shed light on additional occupational component that influence a significant function in the enhancement of this prevalent malignancy. Prolonged interaction with sunlight, prevalent in outdoor occupations such as agriculture and construction, is a major focus. Additionally, the impact of chemical exposures, including polycyclic aromatic hydrocarbons (PAHs), arsenic, and certain pesticides, is discussed by many researchers, emphasizing their relevance in specific occupational settings. Occupational groups particularly vulnerable to skin cancer are identified, including outdoor workers and those in healthcare and agriculture. Reviews also explores the synergy of multiple occupational exposures and their potential interactions with genetic predispositions. Practical preventive measures, such as the use of protective equipment and adherence to safety guidelines, are highlighted to reduce occupational skin cancer risks.This brief overview underscores the urgency of recognizing and addressing occupational hazards contributing to skin cancer. Increased awareness and targeted preventive measures are crucial for fostering safer work environments and safeguarding the health of individuals exposed to occupational risks.

Graphical abstract



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PP-57

UTILITY OF RARE EARTH METAL ION INCORPORATED NANOFERRITES IN REMOVAL OF DYE FROM WATER

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Nanoferrites are proven to be a powerful and commendable material nowadays for the removal of hazardous pollutants from wastewater. Incorporation of rare earth metal ions into these metal ferrites alters the characteristics of specific metal nanoferrites. In this study, Lanthanum doped metal nanoferrites were prepared via sol-gel synthesis. Synthesized doped nanoferrites were characterized through FTIR, XRD, and SEM techniques. The impact of incorporation of lanthanum ions on the adsorption efficiency of different nanoferrites material was checked to the adsorption of methylene blue dye and the results were compared.

Keywords*:* Lanthanum doped nanoferrites; characterization; adsorption; dye removal efficiency; methylene blue.

PP-58

SYNTHESIS AND CHARACTERIZATION OF AMINE FUNCTIONALIZED GRAPHENE OXIDE

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Abstract: The present study explores the preparation and characterization of chemically grafted amine functionalized Graphene Oxide (GO). Initially, Graphene oxide is synthesized from graphene according to Hummer's method. The expanded interlayer structure of graphene oxide can be easily exfoliated by using ultrasonication. Amine functionalized graphene oxide (GO-NH_2) has been prepared by chemical grafting of different amines onto graphene oxide through two step reaction with the aid of thionyl chloride. The samples of GO and amine functionalised graphene oxide have been characterized by using various instrumental techniques. Spectral UV data, FT-IR and XRD diffraction patterns confirm the amine functionalization on graphene oxide. Thermogravimetric analysis was also carried out in nitrogen environment to further probe the occurrence of the grafting reaction. The GO-NH_2 with high surface area and numerous active sites which proved to be a promising material for the removal of heavy metal ions from industrial wastewater.

Key words: Graphene oxide, Exfoliation, Sonication, Fourier Transform Infra-Red Spectroscopy, XRD, toxic metals.

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PP-59

PYROLYSIS OF INDUSTRIAL WASTE LIGNIN INTO VALUE-ADDED FUEL PRODUCTS

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Lignin with alkaline metal oxide catalyst has been used for catalytic fixed bed fast pyrolysis reaction of lignin was performed. The effect of the reaction temperature and different weight percentage loading of metal oxide on the catalyst was examined for the product distribution and quality of bio-oil obtained from lignin. The metal oxide shows significant changes in the high-temperature catalytic co-pyrolysis reaction with lignin. The maximum bio-oil yield was obtained at 550 °C under an inert atmosphere. Further increasing the reaction temperature of pyrolysis reduces the yield of bio-oil. Compared with the non-catalytic pyrolysis reaction of lignin, the catalytic pyrolysis reaction shows high bio-oil yield and aromaticity. The reaction mechanism of acidic and basic sites of catalytic pyrolysis reaction with lignin represents the deoxygenated compounds into phenols and aromatic hydrocarbons. This study illustrates the importance of catalyst over the pyrolysis of lignin and increases the fragmentation and aromaticity of hydrocarbon yield.

Keywords: Lignin, Pyrolysis, catalyst, Bio-oil, deoxygenated aromatics

PP-60

SYNTHESIS AND APPLICATIONS OF GREEN SYNTHESIZED NANOPARTICLES FOR PHOTOCATALYTIC DYE DEGRADATION AND ANTIBACTERIAL ACTIVITY

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Metal oxide photocatalyst is a highly promising agent in the process of water remediation. The purpose of this study is to synthesize nanoparticles using a green production method involving mulberry plant extract. Plant phytochemicals play a crucial role in the production of these nanophase particles. The use of a bioreductant, which is a safe and non-toxic compound, allows for the synthesis of nanoparticles. X-ray diffraction analysis was used to characterize the synthesized nanoparticles, which were found to be in the anatase phase with a crystallite size. The FTIR analysis revealed the presence of bonding and plant derivatives, as well as their reduction. The UV-DRS analysis demonstrated a wide bandgap of 3.16 eV for the nanoparticles and provided insight into their optical properties. The surface morphology of the nanoparticles was examined using FESEM with EDX technique, which allowed for the characterization of the spherical shape and the elemental configurations. The photocatalytic degradation of methylene blue dye was investigated, and the pseudo-first-order kinetics were determined. The cyclic experiments demonstrated the catalytic potential of the nanoparticles. Furthermore, the resistance of the nanoparticles to gram-positive and gram-negative bacteria was evaluated, highlighting their potential for biomedical applications and water remediation due to their catalytic activity and bacterial stability.

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PP-61

Synthesis, Characterization and Application of Silver Loaded Biochar in catalytic reduction of para-Nitrophenol

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p-nitrophenol (PNP) is a common aromatic molecule that is widely employed in the manufacturing of specialty and fine chemicals, including petrochemicals, pharmaceuticals, and insecticides and is a refractory pollutant that is extremely harmful to the environment and is categorized as a priority pollution. Low PNP concentrations for an extended period of time can have major health effects in humans, including methemoglobinemia, liver and kidney damage, and other illnesses. Catalytic reduction of such compounds helps remediate the wastewaters effectively. For efficient catalysis a simple, economical and environmentally beneficial method has been followed to fabricate two silver-loaded biochar nanocomposites prepared by doping silver in biochar made from sweet potato pulp (AgBiOC) and sweet potato peel (AgBiOCPS). The synthesis of AgBiOC and AgBiOCPS has been outlined in the graphical abstract below and were characterized by various techniques such as FTIR, UV, XPS, SEM, TGA and BET. The FTIR spectra showed prominent peaks at 3200 cm^{-1} which can be attributed to the cellulosic O-H stretching, at 1691 cm^{-1} which corresponded to the C=C stretching of the aromatic bending of the C-H group and the peaks of Ag-O between 900-600 cm^{-1}. The TGA results also reveal that the catalyst is stable and not much weight loss is observed. The XPS results were useful for finding the amount of silver doped in the biochar. AgBiOC and AgBioCPS effectively catalyzed the reduction of p-nitrophenol. The reduction studies were optimised by varying the parameters such as amount of catalyst and amount of $NaBH_4$.

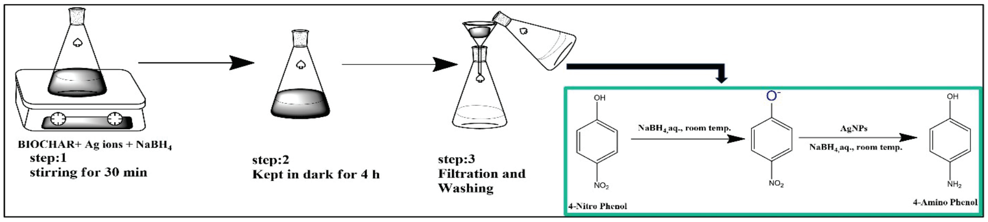

Fig 1: Synthesis of Silver loaded biochar

Keywords: refractory pollutant; catalysis; nanocomposites; biochar; remediate; p-nitrophenol

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PP-62

Removal of Brilliant green dye using bio-char of Bahawa seeds and its regeneration studies

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Brilliant green is a widely used cationic dye known for its excellent applications in a number of industrial areas. Owing to its high potential of imparting color and non-biodegradable nature, it remains persistent in the nature for a longer duration. Moreover, cationic dyes are also known to be carcinogenic and hence demands an immediate attention for its treatment before being released into the natural systems.

In this study, the carbonized form of Bahawa seeds, obtained by charring the material in an inert atmosphere at 400ºC in the presence of phosphoric acid as an activator, is employed as the adsorbent for the efficient uptake of Brilliant green (BG) dye. The acquired bio-char was extensively characterized using a variety of spectral techniques such as FT-IR, SEM-EDAX, TGA-DTA, XRD and BET to assure the presence of desired qualities. The BET analysis revealed the high porosity of the material with the surface area of 1120.6 $m^2 g^{-1}$ which is indicative of the potential of the material. The operational parameters for the adsorption of BG dye onto the bio-char were optimized and the results obtained were subjected to critical analysis with regard to the maximum adsorption capacity, adsorption isotherm, kinetics and thermodynamics. The maximum adsorption capacity for the uptake of BG dye was obtained to be 284.35 mg g^{-1} using 50 mg char onto 50 mL 200 mg L^{-1} dye concentration for a time interval of 60 min at neutral pH. The results obtained indicate that the Langmuir isotherm model and pseudo second-order kinetics fit well with the existing data and the reaction proceeds through an exothermic energy dissipation.

Gamma irradiation of the loaded bio-char using a Co^{60} source was carried out to investigate the regenerative ability of the material and it was found that a dose of 30 KGy is sufficient to regenerate the adsorbent satisfactorily with a minimal reduction in adsorption capacity.

Keywords: Adsorption; Carbonization; Brilliant green; Regeneration, Kinetics; Thermodynamics.

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PP-63

Role of Women in Water Supply, Water Quality and Sanitation Programme

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Abstract

Water is a crucial life-sustaining force, without which neither existence nor progress would be possible. Its prominence extends to both national and international agendas, as the strain on water resources arises from various quarters. Urbanization, escalating industrial activities, extensive use of fertilizers and pesticides in agriculture, and the discharge of untreated sewage and industrial effluents into the environment collectively contribute to surface and groundwater pollution. Consequently, this pollution infiltrates drinking water sources in both urban and rural areas, necessitating increased investment in water treatment, thereby escalating costs. To counteract this pollution menace, there is a growing emphasis on community involvement in managing water quantity and quality, as well as addressing sanitation and health concerns.

In recognizing the indispensable role of water, it becomes imperative to acknowledge the significance of community participation in safeguarding water sources. Both urban and rural areas are witnessing a surge in pollution, prompting the need for collaborative efforts to mitigate these challenges. Community participation is integral to managing water quantity and quality effectively. It also extends to sanitation and health considerations, acknowledging that safeguarding water sources requires collective action. The pivotal role of women, who constitute half of the global population, cannot be overstated. As caregivers for children, guardians of family health, and managers of household resources, their participation, involvement, and empowerment are essential across all levels of water. The presentation will describe the extensive contributions of women in water management. Recognizing women's multifaceted roles, it is essential to underscore the importance of their education, envisioning them as future trainers. This educational empowerment is seen as a cornerstone for sustainable development in managing water resources.

Key words: water quality, water resource management , role of women

PP-64

Quantification of Gibbsite and Boehmite phases in Alumina Hydroxide, using X-Ray diffraction Technology

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Abstract

Alumina hydroxide is conventionally produced through the Bayer process. It is used as a feed material to produce metallurgical as well as chemical grade alumina. The major applications of Alumina hydroxide are fire-retardant filler for cable/polymer ,Li-ion battery separators, catalysts, pharmaceutical products, artificial marble, solid surface etc. For such types of applications, the purity as well as mineralogical phases play an important role in determining the suitability of their material for specific uses. Conventionally ,chemical impurities and qualitative phases are determined to understand the suitability of material. However, some of the value-added products it is very much required to quantify the phases of their material. In the present study, a detailed quantitative method was established to determine Gibbsite (α-Al(OH)3) and Boehmite (γ-AlOOH) phases, using XRD technique, where integrated intensities (surface area) of the specific reflections were converted into concentrations by using calibration curves. The X-ray diffraction lattice plane reflections of (α-Al (OH)3) such as (002) [d = 4.845 Å] and (111) [d = 3.313 Å], and for (γ-AlOOH) such as (020) [d = 6.107 Å] and (130) [d = 2.344 Å] were integrated in the measurement process. Integrated intensities were converted into concentrations using calibration curves. The concentrations obtained for two reflections were averaged respectively to determine the Gibbsite (α-Al (OH)3) and Boehmite (γ-AlOOH) contents in Alumina Hydroxide.

Keywords: XRD, Phase, Gibbsite, Boehmite

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PP-65

Optical beaviour of Gd2O3:Nd3+/Yb3+ and application for optical thermometry

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Abstract:

Rare earth (RE) ion-containing phosphors are frequently used in optical temperature monitoring. Furthermore, there may be biological uses for phosphors' near-infrared (NIR) emission. Here, the sol-gel approach is successfully used to synthesise Gd_2O_3:x%Nd^{3+}/Yb^{3+}($0.2 \le x < 0.8$) samples, and their phase and shape are characterised. Rietveld refines the XRD data. Both the upconversion (UC) and downshift (DS) emissions are investigated under continuous wave (CW) laser stimulation at 980 nm. Using fluorescence intensity ratio (FIR) technology, the temperature sensing capabilities of thermally coupled levels (TCLs) and non-thermally coupled levels (non-TCLs) of Gd_2O_3: Nd^{3+}/Yb^{3+} phosphors are examined. Based on non-TCLs, the greatest relative sensitivity of I761 nm/I550 nm reaches 6.54% K-1 in the temperature range of 303-523 K. Concurrently, the I761 nm/I1000 nm-1500 nm maximal relative sensitivity reaches 3.13%. The impact of the laser-induced heating (LIH) effect is also investigated. At CW excitation, the relative sensitivity would drop in comparison to square wave (SW) pumping. Lastly, there is also discussion of temperature uncertainty and durability. The findings demonstrate that, within the biological window, the Gd_2O_3:Nd^{3+}/Yb^{3+} samples exhibit reduced temperature uncertainty, greater relative sensitivity, and durability. Consequently, in the field of biology, phosphors can be employed as optical thermometers.

Key Words: Upconversion, Downshifting, Gd2O3: Nd3+/Yb3+ phosphors, optical thermometers

PP-66

Universal method for estimation of Hydrogen content & H/C ratio in all type petroleum products including oxygenated fuels

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Abstract

Hydrogen content is an important parameter for all petroleum products, because the performance of the products for specific application depends on the concentration of hydrogen in it. Further, hydrogen content can be used as a measure for quality control during the production process and assess the quality of the products, which is governed by the catalyst used. The assessment of the ignition quality of a wide range of oxygenated hydrocarbons is one key challenge in the identification of novel molecular entities qualifying as biofuels or biofuel blend components derived from oxygen-rich feedstocks. However, the measurement of fuel properties is time-consuming, cost-intensive, and limited to the operating conditions. The physicochemical properties of oxygenated fuels (E20 Gasoline and ED5, MD15 Diesel) are directly influenced by chemical composition. Thus, a thorough investigation should be conducted on the inherent relationship between fuel properties and composition for the design and synthesis of high-grade fuels and the prediction of fuel properties in the future.

In order to calculate total hydrogen content and Carbon/Hydrogen Ratio in fuels specially oxygenated fuels consumption during production of different petroleum products an effort has been made to develop a universal method based on nuclear magnetic resonance (NMR) technique, that allows estimating hydrogen content in all petroleum fractions, ranging from IBP to 530+ °C. This work summarized the effects of fuel composition and hydrocarbon molecular structure on the fuel physicochemical properties. The results from this method implicate that the coupling of H/C molar ratio is suitable for the estimation of Physical properties and effectiveness for the design, manufacture, and evaluation of hydrocarbon fuels. NMR method is fast, robust and environment friendly.

Keywords: NMR spectroscopy, Carbon/Hydrogen Ratio, oxygenated fuels