FAST 2.0 | FUTURE ASPECTS OF SUSTAINABLE TECHNOLOGIES

2nd INTERNATIONAL CONFERENCE ON FUTURE ASPECTS OF SUSTAINABLE TECHNOLOGIES

(Virtual Platform)

20-21 October 2020

FAST 2.0

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16.10.2020

FROM THE DESK OF DIRECTOR

It gives me immense pleasure to share with you that Central Institute of Technology Kokrajhar, Deemed University Status, is organising International Conference. The theme of the 2nd conference on "Future Aspects of Sustainable Technologies" is very enriching and encouraging which includes all possible viable science and technology. The institute is taking a step towards creating a healthy academic horizon much needed for all-round development of the national with international flavour. I welcome all esteemed delegates and participants to deliver their interesting & valuable talks in the conference FAST 2.0.

I acknowledge efforts put by all organizing members. I wish a grand success.

Debkumar Chakrabarti

Prof. Debkumar Chakrabarti

Officiating Director, CIT Kokrajhar
Concurrently Professor at IIT Guwahati

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16.10.2020

FROM THE DESK OF REGISTRAR

Greetings from CITK……..

It is with much pleasure that our institute is going to organize the 2nd International Conference on "Future Aspects of Sustainable Technologies" 20-21 October 2020. This conference will bring wave of knowledge from different fields and different parts of the world with national to our institute.

With this message, I am honoured and delighted to welcome you to attend this conference. I welcome each and every participants of the conference to feel the learning environment of CIT Kokrajhar and to make the event grant success.

As one of the active member, I believe that the success of the conference depends ultimately on all members who have worked extremely hard for the details of important aspects of the conference program FAST-2.0.

Finally, I wish the conference great success.

Ms. Chaitali Brahma

Registrar

CIT Kokrajhar, Assam

QLEAP ACADEMY, PUNE

Dr. Rajiv Kumar Chaturvedi
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It gives me immense pleasure that Department of Chemistry, Central Institute of Technology Kokrajhar, Deemed University Status, under MHRD, Govt. of India, is organising second version of International Conference on "**Future Aspects of Sustainable Technologies (FAST 2.0)**" on 20-21 October 2020 through online mode. The theme of the conference on "**Future Aspects of Sustainable Technologies**" is very enriching and encouraging which includes viable science and technologoes. The sustainable and eco-safer technologies in general and chemical sector in particular, are the need of the hour for our sustainable future.

The institute is taking a step towards creating a healthy academic horizon much needed for all-round development of the nation as well as the world at large. I am sure that all esteemed delegates and participants will deliver their interesting & valuable talks in the conference FAST 2.0.

I appreciate the great efforts put in by the organizers. I wish this conference a grand success.

With best wishes

(Dr. Rajiv Kumar Chaturvedi) - Former CS and Head, Innovation Centre, Tata Chemicals, Pune

RMIT UNIVERSITY

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16th October 2020

Fast 2.0 Organizing Committee
Dept. of Chemistry,
CIT Kokrajhar,
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Dear Delegates,

The global population is predicted to reach of 9 billion by 2050. In response, the United Nations has identified 13 Sustainable Development goals that offer a "blueprint to achieve a better and more sustainable future for all", addressing global challenges including climate change, resource management, environmental degradation, food security, clean water and health.

Now more than ever, scientists and engineers need to work together to develop innovative technologies to tackle these global challenges in an environmentally and economically sustainable way. The devastating impact of the COVID-19 pandemic has highlighted the fragility of modern society, and the importance of international research collaborations in developing rapid responses to such challenges. As a counterpoint, the resulting rise of virtual conferences is advancing global scientific cooperation, providing new engagement opportunities to the disadvantaged, and promoting inclusivity and diversity.

The International Conference on Future Aspects of Sustainable Technologies (FAST 2.0) will address key aspects of chemical, materials and biological sciences, including green and sustainable technologies, waste minimisation and valorisation, renewable energy and nanomaterials, which underpin 21st century societal development. From a personal perspective, I am excited to hear the latest scientific discoveries and their application to the benefit of humanity and the environment, and to engage with researchers from diverse backgrounds.

I wish the organizers every success with this conference, and hope that you find the presentations and discussions stimulating and rewarding.

Sincerely,

Professor Karen Wilson

17-10-2020

MESSAGE FROM THE DESK OF CONVENER

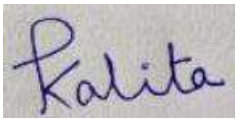
I am delighted to say that Central Institute of Technology Kokrajhar (Deemed To be University) is organising 2nd International Conference on "Future Aspects on Sustainable Technologies" (FAST 2.0) on 20-21 October 2020, which would be a glorious moment for our CIT Kokrajha Family. We had received positive response from Eminent Persons across the globe as well as the nation along with our native places. We believe that this conference will provide a wide and versatile platform to exchange the scientific as well as technological knowledge along with diverse applications towards the society.

We have received a very good number of participants for both oral and poster presentation from varied area of science and technology covering a wide spectrum of themes related sustainability. We are very much happy to publish all those as a conference abstract book along with inspiring messages. We hope, this book will be a valuable and memorable asset for the contributors, host institute as well as other Academic and Research bodies.

On behalf of organizing committee of FAST 2.0, I would like to extend our gratefulness to the Director, Professor Debkumar Chakrabarti, for his approval with strong encouragement. We also very much obliged to Registrar Mrs. Chaitali Brahma for her continuous support and cooperation in all dimensions. The programme would not be up to the mark without the full contribution of members of organizing committee, staffs, research scholars, speakers, participants, students, volunteers, and all who have joined their hands to make the event grand success. So, we are very much thankful to them from bottom of heart.

We would like to convey our best wishes to you all and appeal you to make our conference a great success.

With Best Regards



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KEYNOTE SPEAKERS

FAST 2.0/KS/01

Catalysis for highly selective and sustainable organic transformations

Rajiv Kumar Chaturvedi

Co-Founder and ED, QLeap Academy, Pune

Former Chief Scientist, Innovation Centre, Tata Chemicals Ltd, Pune, and Ex Head of Catalysis Division, National Chemical Laboratory, Pune.

Abstract

Catalysis in general and heterogenous catalysis in particular has revolutionized the petroleum and petrochemicals industry and provided sustainable solutions in specialty chemicals sectors also, apart from offering tremendous opportunities to researchers for understanding the nuances of unique structural and catalytic capabilities of the wonder materials. Selective catalytic reactions either in vapour phase or in liquid phase are highly desirable from a sustainability point of view where no or minimal byproducts are formed. Another aspect for liquid phase heterogeneous catalysis using solid catalysts is that the reactions should be carried out either using ecofriendly reaction medium or solvent like water or under solvent-free conditions.

Here, a comprehensive review of eco-safer heterogeneous catalytic organic transformations in petroleum refining, petrochemicals and specialty chemical sectors will be provided. Porous solds like zeolites and related microporous materials as well mesoporous solids as wonder catalytic materials will also be highlighted. Industrially important examples for regio-, chemo-, as well as stereo-selective organic transformations are main focus of the present work. The chemo, stereo as well as diastereo-selective epoxidation of alkenes, allylic alcohols etc, using microporous Ti-silicate (TS-1) and other c solids as catalysts and dilute H_2O_2 using water as reaction medium will also be presented.

Further, various mesoporous materials like MCM-41, SBA-15 etc were organofunctionalized with various chiral and achiral ligand for harnessing the advantages of homogeneous catalysis using solids catalysts under heterogeneous catalytic condition. and used as catalysts for following reactions.

- Enantioselective hydrogenation of prochiral carbonyl compound where as high 99% ee could be achieved using a solid catalysts (organofunctionalized MCM-41 with chiral ligands).
- Michael addition of indoles to enones catalyzed by triflic acid functionalized mesoporous Zr-TMS catalyst under solvent free reaction conditions.
- Coumarin synthesis via Pechmann type of reactions using these materials under solvent free conditions or using solid catalysts under solvent free reaction conditions, water as reaction medium.

FAST 2.0/KS/02

Designing advanced catalytic materials for biorefining of waste biomass

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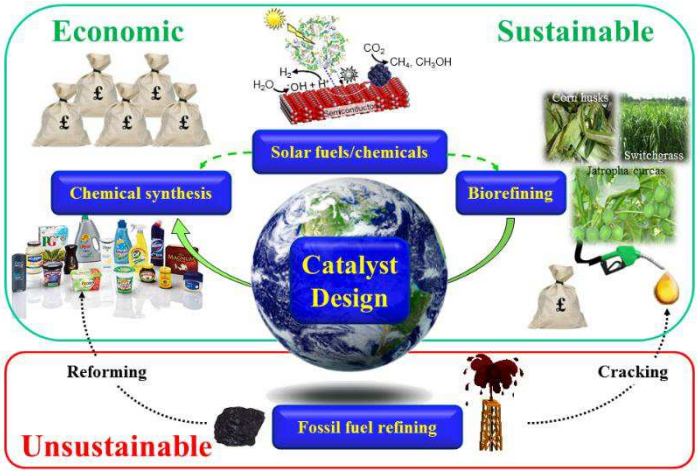
Absrtract:

Concerns over dwindling oil reserves, carbon dioxide emissions from fossil fuel sources and associated climate change is driving the urgent need for clean, renewable energy supplies. If average global temperature rises induced by greenhouse gases are not to exceed 1.5 °C, then estimates indicate that a large proportion of oil, gas and coal reserves must remain untouched [1]. Biomass is Nature's own incredibly successful solar conversion and energy storage system, and a versatile energy resource to produce heat and electricity on demand, or even be converted to liquid transport fuels and chemicals. Indeed, biomass, derived from agricultural and forestry residues, or non-food sources of triglycerides are a sustainable source of carbon that can provide low cost solutions for transportation fuels and organic chemicals. Waste can become a key resource or feedstock, with the implementation of technology for biomass production and conversion predicted to generate ~15 Billion Euro income to the rural economy across the EU, with 16 % of transport fuel potentially supplied by waste derived biofuels by 2030, resulting in over 60 % reduction of GHG emissions [2]. Akin to petroleum refining, biorefining will integrate biomass conversion processes to produce fuels, power, and chemicals, thereby increasing the economic viability of bio-derived processes (**Scheme 1**). Indeed, the US DoE identified a range of sugar derived 'Platform Chemicals' produced via chemical or biochemical transformation of lignocellulosic biomass that would be potential targets for production in biorefineries [[3]].



Scheme 1: Biorefining versus Petroleum refining

Catalytic technologies played a critical role in the economic development of both the petrochemical industry and modern society, underpinning 90 % of chemical manufacturing processes and contributing to over 20%

of all industrial products. In a post-petroleum era, catalysis will underpin bio-refinery technology, and researchers will need to rise to the challenge of synthesising chemical intermediates and advanced functional materials and fuels from non-petroleum based feedstocks [4]. This presentation will discuss the challenges faced in the design of catalysts for biomass to energy processes, and highlight recent successes in catalyst design which have been facilitated by advances in nanotechnology and careful tuning of catalyst formulation [5-10].

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INVITED SPEAKERS

FAST 2.0/IS/01

Environmental, Health, and Safety Implications of Nanomaterials: Critical Issues

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Abstract

Responsible development includes understanding potential environmental, health, and safety (EHS) implications of nanomaterials as well as the ethical, legal, and societal implications (ELSI) of nanotechnology. Nanotoxicity is majorly contributed to the small size and large surface area of nanomaterials, which allow easy dispersion and invasion of anatomical barriers in human body. Unique physio-chemical properties of nanoparticles make the investigation of their toxic consequences intricate and challenging. This makes it important to have an in-depth knowledge of different mechanisms involved in nanomaterials' action and toxicity. Nano-toxicity has various effects on human health and diseases as they can easily enter into the humans via different routes, mainly respiratory, dermal, and gastrointestinal routes. This also limits the use of nanomaterials as therapeutic and diagnostic tools. This talk will be focussed on our commitment to the responsible development of nanotechnology as one of its four main goals, and as an important part of its environmental, health, and safety (EHS) research strategy. This includes sound, scientific assessment of nanotechnology's benefits and risks, and an understanding of the potential EHS impacts of nanotechnology

FAST 2.0/IS/02

FAST 2.0/SP/04Fabrication of Composite Materials Containing Nanostructured Metal Oxide Semiconductor and Polymer Capped Plasmonic Nanoparticles: Photocatalysis

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Abstract

This work attempts to generate metal oxide and plasmonic nanoparticles based materials on solid substrates. Metal oxide-based semiconductor nanostructures were deposited on solid substrates using a sol-gel method or hydrothermal method. We demonstrated ex-situ synthesis of plasmonic nanoparticles, and the nanoparticles were capped with cationic water-soluble polymers. Metal oxide fabricated substrates were dip-coated in water dispersed colloidal nanoparticles to create composite materials. UV-visible spectroscopy monitored the photocatalytic activity of the composite materials. All materials were characterized by Scanning Electron Microscopy (SEM), EDX line analysis, XRD, and DRS Spectroscopy.

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FAST 2.0/IS/03

Nanocatalysis: A Key Role for Sustainable Energy and Environment

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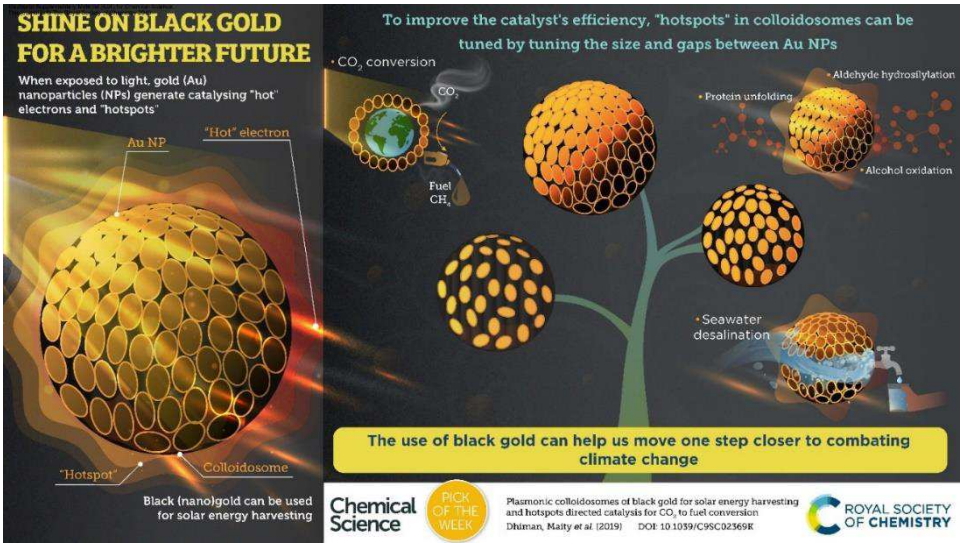
Abstract:

Energy and environment are two of our critical societal challenges. The use of hybrid nanomaterials to harvest solar energy as well as capture and convert CO_2 seems to be the best way combat climate change. We recently reported the synthesis of a new class of dendritic fibrous nano-silica (DFNS).[1-13] Fibrous morphology observed in these nanospheres has not been seen before in silica materials. Uniqueness of DFNS is, its high surface area is by virtue of its fibrous structure instead of pores (unlike MCM-41 and SBA-15 silicas), and hence easily accessible. More than 150 groups worldwide is now using our patented DFNS for various applications such as catalysis, solar-energy harvesting, energy storage, self-cleaning antireflective coatings, surface plasmon resonance-based ultrasensitive sensors, CO_2 capture, and biomedical applications.[1] We showed successful utilization of DFNS for range of important catalytic applications such as metathesis, hydrogenolysis, oxidation, hydrogenation, coupling reactions etc[2-8] as well as for CO_2 capture.[9] We have also developed a new method of fabricating active photocatalysts by TiO_2 coating of DFNS.[10] and plasmonic black gold.[11] In this seminar, I will discuss these results on synthesis and application fibrous nano-silica (including black gold,[11] amorphous zeolites[13] and defected silica[12]) for fine chemical synthesis, solar energy harvesting, CO_2 capture-conversion and waste plastic to chemicals.



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FAST 2.0/IS/04

2D nanocomposite materials for sunlight driven benzene hydroxylation and environmental remediation

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Abstract:

Sunlight driven semiconductor based photocatalysis is an efficient technology owing to their possibility of accomplishing energy cycle without environmental pollution and production of renewable energy. Graphitic carbon nitride (g-C_3N_4), a 2D semiconductor layered like material has gained potential interest in photocatalysis owing to its suitable band gap (2.7 eV) electronic structure, superior visible light response, high thermal stability and nontoxicity.[1] This π- conjugated polymeric material showed excellent photocatalytic efficiency towards hydrogen production from water splitting as well as visible-light driven photodegradation of various organic pollutants. However the photocatalytic efficiency of g-C_3N_4 is greatly restrained due to low specific surface area and high recombination probability of electron-hole pair. Because of these characteristic properties photocatalytic organic transformation through g-C_3N_4 based nanocatalysts has currently become very promising and challenging topic in research field. However, like other photocatalysts, the g-C_3N_4 has encountered with high recombination of photogenerated holes and electrons which diminishes its photocatalytic activity. To avoid this circumstances g-C_3N_4 has been blended with different narrow band gap materials to build a direct Z-scheme system for enhanced photocatalytic performance.[2,3] In view of this, a series of economic and environmental benign Z-scheme g-C_3N_4 supported nanocomposites were synthesized. The photocatalytic activity of these nanocomposites were investigated for the hydroxylation of benzene, removal of pollutant dye from water etc.

Keywords: g-C_3N_4, Z-scheme, holes

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FAST 2.0/IS/05

A review on development of metal-organic frameworks (MOFs): Synthetic approach and applications

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Abstract:

Metal-organic frameworks (MOFs) or porous coordination polymers are interesting solid crystalline materials, which became very popular field of research within last two decades. They shows very high potential in different application purposes, such as small molecule separations [1], gas storage [2], heterogeneous catalysis [3], water harvesting [4], chemical sensing [5] etc. Some of the main features of MOFs are: they are inorganic-organic hybrid materials with permanent porosity and they are built from metal nodes or molecular entities (Secondary Building Units, SBUs), coordinated by organic bridging ligands, which are also called linkers resulting in the formation of one dimensional, two dimensional and three dimensional coordination network. Development of using Secondary Building Unit (SBU) as a node with poly-topic linkers results in the synthesis of extensive porous three dimensional network.[6] The porosity of these materials can be systematically tuned by judicious selection of molecular building units and variety of different organic functional ligands. This tuning ability of MOFs can be achieved either through predesigning or post-synthetic approaches. Here we will discuss the development of some interesting and novel MOFs in terms of their rationale designing, synthesis and applications.

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FAST 2.0/IS/06

Control Drug Nucleation on SAMs

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Abstract:

Understanding drug nucleation is extremely important in order to obtain control over the crystallization process on demand.[1] The crystallization events can be guided by molecular recognition at the heterogeneous interface expressed by intermolecular interactions.[1] Gold and silicon surfaces were functionalized with organic thiols/silanes and such functional self-assembled monolayer (SAM) substrates were introduced to control the crystallization process of flexible drug molecules. Anti-inflammatory drug Mefenamic acid and antimicrobial sulfa drug Sulfathiazole are conformationally flexible and known for its concomitant crystallization. They are employed as representative examples. The organic interfaces (SAMs) were identified as efficient approach to nucleate desired polymorph of conformationally flexible drugs.[2,3] The crystallization on SAM surface is essentially kinetically driven, and only novel metastable forms of the drugs were crystallized out by directing the nature of the intermolecular interactions at the interfaces.

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ORAL PAPERS

FAST 2.0/OP/01

Biosynthesis of triangular-shape ZnO nanoparticles using Tecoma stans and its antimicrobial activity

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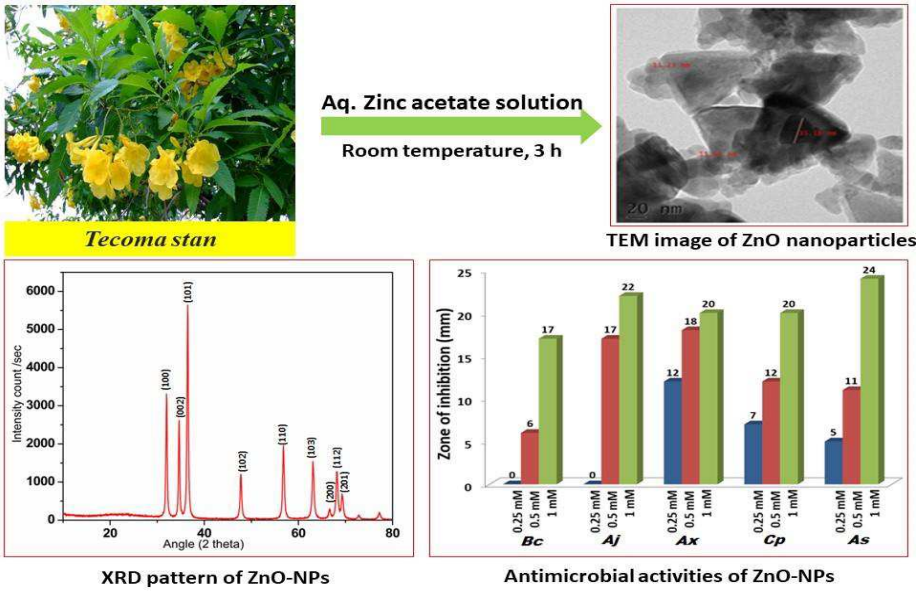
Graphical abstract



Abstract

The present work reports the first green synthesis of zinc oxide nanoparticles (ZnO-NPs) using Tecoma stans leaf extract. The ZnO-NPs have been investigated by X-Ray Diffraction (XRD), Ultra Violet-Visible (UV-Vis), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM) and Fourier Transform-Infra Red (FT-IR) analysis. XRD investigation confirms the crystalline structure of ZnO. The TEM images show triangular shape ZnO-NPs with sizes running from 15-20 nm. The XPS spectrum revealed the presence of Zn and O in the sample. Photoluminescence studies of ZnO-NPs displayed a sharp emission of blue band at 447 nm which is attributed to the defect structures in ZnO crystal. The presence of alcoholic, phenolic amide groups in the plant extracts is responsible for the formation of ZnO-NPs. The synthesized ZnO-NPs showed a very high antibacterial property against five bacterial strains such as Bacillus cereus, Acinetobacter johnsonii, Achromobacter xylosoxidans, Achromobacter spanius and Chromobacterium pseudoviolaceum, with the highest zone of inhibition (ZOI) of 24 mm being shown against Achromobacter spanius strain. Further, the synthesized nanoparticles displayed excellent activities against four fungal strains, where a highest ZOI of 30 mm was observed against Penicillium citirinum, hence proving its high efficacy as antimicrobial agents.

FAST 2.0/OP/02

An efficient colorimetric sensor for the detection of cyanide ions by hydrazide derivatives

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Abstract

With advancements in industrial sectors, the environment has become more prone to toxins of various forms and is posing a major threat to human life [1,2]. Recognition of such toxins has always been in the lime light of host-guest chemistry [3]. Recognition of cations such K^+, Na^+, Ca^{2+}, Mg^{2+}, Cu^{2+}, Fe^{2+}, etc and anions such as F^-, Cl^-, Br^-, I^-, CN^-, OAc^-, $HCO_3^-H_2PO_4^-$, ClO_3^-, etc have always been significant as they can influence at various stages biological processes in living systems [4,5].

Herein, three model hydrazide derivatives, acetohydrazide, benzohydrazide and nicotinohydrazide were synthesized and were investigated for their anion sensing abilities with F^-, Cl^-, Br^-, I^-, CN^-, OAc^-, HCO_3^-, $H_2PO_4^-$ and ClO_3^-. The anion sensing properties were studied in acetonitrile by UV-Visible absorption spectroscopic and ^1H NMR spectrometric techniques. The experimental results were supported with Density Functional Theory (DFT) calculations. Significant changes were observed in the absorption spectra of all hydrazides upon sensing CN^-, while benzohydrazide was able to detect F^- in addition to CN^-. The changes were accompanied by change of color that could be observed through naked eye. The proposed mechanism of sensing could be due to the deprotonation reaction from N-H moiety of the hydrazides. The natural bond orbital (NBO) analysis employing DFT method supports the experimental results. The herein reported hydrazides possess the ability to detect cyanide contamination at high levels of specificity, sensitivity and selectivity

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FAST 2.0/OP/03

Green Technology to Convert Plastic Waste To Fine Chemicals

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Abstract

Consumption and demand for plastic polymers is rising at a steady rate across the globe. Most poly-olefin polymers, such as Poly Ethylene (PE), Poly Styrene (PS), and Poly Vinyl Chloride (PVC) are non-biodegradable and release noxious gases into the environment on combustion, resulting in environmental pollution. For both the environmental and economic purposes, turning waste plastics into fuel holds great promise. In this research, plastic wastes are subjected to various processes like depolymerisation, thermal cracking and distillation in order to produce value-added products. The resultant transformation would be an opportunity to create money from waste. In the experimental studies, distillation of plastic polymers was carried out in different non-volatile organic solvents, ionic liquids, and biodiesel at the operating temperature of 80 to 100 ^{0}C. Proposed mechanism of thermal cracking and depolymerisation are also discussed in details. The findings are more viable and less energy intensive in comparison of pyrolysis process. The calorific value of the final product is 13% more in comparison to biodiesel with polymer to solvent ratio of 1:10 wt%. The bottom residue was used as composite for bricks that were partially substituted with sand particles provided a strength of >20MPa with considerable reduction in density. In to all the strategy employed by us follow ultimately a Cradle to Grave approach essential for non-biodegradable waste reduction.

Keywords: Poly-olefin polymer, Biodiesel, LDPE, Calorific value, Depolymerisation, Energy-incentive

Bibliography: Dr Amita Chaudhary is currently working as a faculty in the Department of Chemical Engineering, Institute of Technology, Nirma University. She has completed her doctoral studies from the Chemical Engineering Department at Indian Institute of Technology, Delhi. She has published the number of papers in the area of ionic liquid synthesis, CO_2 sequestration, corrosion science, and waste management, etc. in the International and National referred Journals. She has presented/published her research work in many International and National Conferences/Proceedings. She is actively involved in research and is highly passionate about R&D of new technologies. She has a published patent on the synthesis of ionic liquid for carbon capture in collaboration of IIT Delhi and FITT, Delhi. She is actively involved in students Idea Lab projects based on interdisciplinary research and minor funded projects. She is a member of various prestigious organizations like ISTE, IIChE.

FAST 2.0/OP/04

Diversity Oriented Synthesis of Biologically Active Heterocycles using Sustainable Technologies

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Abstract:

Synthesis of highly functionalized heterocyclic small molecules is important in drug discovery programme due to their selective binding ability to the biological targets with respect to their chemical diversity.[1] Recently, using sustainable technology as starting points for diversity oriented synthesis (DOS) have gained prominent importance because of high degree of chemical and structural diversity. In this report, we are discussing about the use of microwave-assisted green organic synthesis, water mediated reactions, ionic liquid supported metal catalysts, nanocatalysts as a possible tool for sustainable technologies for the synthesis of bioactive heterocycles.[2]

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Biography: Dr Kaushik Chanda obtained his PhD from National Chiao Tung University, Taiwan in 2010, and is working as senior Assistant Professor in the Department of Chemistry, Vellore Institute of Technology, Vellore from 2013 onwards. He has published more than 60 research articles in international peer reviewed journal along with 5 book chapters, two books, one US and two Indian patents. He is the recipient of CSIR-EMR-2017 research grant. His research interest is in diversity oriented synthesis, nanocatalysis, anticancer drug design etc.

Divergent reactions of Indoles

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Abstract:

One of the major current challenges in organic synthesis is the creation of molecular diversity and complexity from simple and readily available substrates. Indole derivatives are important heterocyclic compounds with various applications in medicinal and pharmaceutical indrusties. Indole is the most frequently found structural motif in nature. Indole derivatives widely occur in natural products such as those from plants, fungi, and marine organism. Organic chemists are attracted towards developing novel methodologies for the synthesis indole derivatives due to the various advantageous properties of these compounds.

Our group is interested in developing various novel methodologies for the synthesis of indole derivatives using multi-component reactions, C-H functionalizations, and environmentally benign methods.

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FAST 2.0/OP/06

Complete oxidation of propene using ceria modified Cu/Hydroxyapatite catalyst: Effect of preparation method and Ce concentration

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Abstract:

Emission of pollutants from various sources is the major concern to protect the fauna and flora. Propene is one component of diesel exhaust (DOC) and volatile organic compounds (VOC) emission. The Cu/HAp has been investigated for oxidation of hydrocarbon. However, Cu/HAp showed low activity at lower temperature. The activity could be improved by addition of Ce due to its oxygen storage capacity and facile redox properties. Furthermore, 0.4 mol of Cu and 0.1 mol Ce supported on hydroxyapatite (0.5 mol of HAp) has been prepared by successive deposition and coprecipitation method. The catalyst prepared by successive deposition showed improvement in low temperature oxidation of propene. In order to optimize the Ce concentration, the series of Ce modified Cu/HAp catalyst has been prepared by successive deposition method and activity of these catalysts was compared with 0.5 mol Cu supported on HAp. All catalysts are characterized by PXRD, FTIR, BET, H_2-TPR, Raman, XPS, FESEM and HR-TEM. The $Cu_{0.4}/Ce_{0.1}$/HAp prepared by successive deposition method showed formation of large number of smaller Cu^{2+}, Ce^{3+}, adsorbed oxygen species, Ce nanorod and more defects in the structure compared to the remaining catalysts. The $Cu_{0.4}$-$Ce_{0.1}$/HAp showed a maximum propene conversion at lower temperature compared to the $Cu_{0.5}$/HAp.

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FAST 2.0/OP/07

Plumeria rubra f. rubra: A Novel Ligand for Cupric Ion Detection

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Abstract:

Many popular household items and garden plants are available that could be used as pH indicators. Many plants contain anthocyanins that are pH-sensitive, which make them suitable for measuring acid and base concentrations. The flower of Pumeria rubra are available in multiple vibrant colours. Out of these, pinkish-red coloured flower named Plumeria rubra f. rubra has been studied for its detection ability via complex formation with cupric ion (Cu^{2+}). A noticeable sharp and distinct colour change has been observed with cupric ion in the methanol extract of the Plumeria rubra f. rubra petals. Effect of different counter ions such as sulphate, chloride, nitrate and acetate are also studied with same cupric ion with the same experimental conditions.

Keywords: Plumeria rubra, cupric ion, complexing agent, natural indicator

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FAST 2.0/OP/08

Recovery of Lignin from pulp and paper mill effluent by forward osmosis process

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Abstract:

Cellulose triacetate (CTA) forward osmosis (FO) membrane from Hydration Technology Innovation (HTI), USA was tested in a locally fabricated FO system to concentrate pulp and paper mill effluent. The industry is among the 17 most polluting industries with intensive water consumption and wastewater generation (MoEFCC, Government of India). The CTA membrane was studied with deionized water as feed solution and 1M NaCl as draw solution, which resulted into water flux of 5.8 L/m^{2}h and reverse salt flux of 0.2 g/L. A concentration stepping method was used to determine the critical draw concentration with lignin solution as the model feed. Up to 1.5 M NaCl, there was no deviation in flux between the baseline (deionized water feed) and the lignin solution but a marginal deviation (8% and 21% respectively at 2 M and 3 M) was seen thereafter. The average water flux after 24h FO with wastewater and 1.5 M NaCl was 5.4 L/m^{2}h with 62% water recovery. Rejection of chemical oxygen demand (COD), color (as lignin) was evaluated. Lignin and COD rejection in pulp and paper mill wastewater was 90% and 64% respectively. The preliminary results indicate that FO is promising for water and lignin recovery from waste streams.

Key words: Pulp and paper mill wastewater; Forward osmosis; Cellulose triacetate membrane; Water recovery; Lignin recovery.

FAST 2.0/OP/09

Greener synthesis of acridinium photocatalysts and their application towards efficient organic transformations

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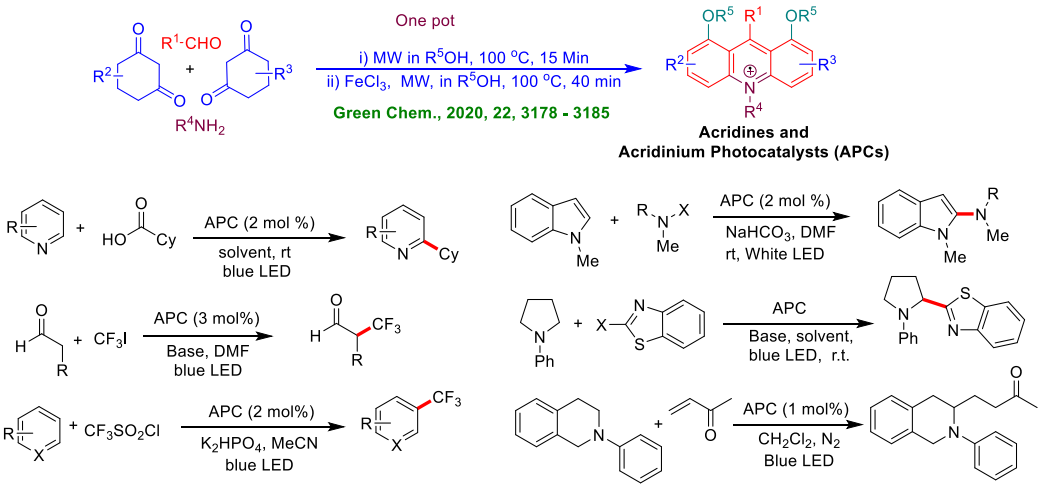
Abstract:

Acridines and Acridinium ions are one of the earliest known important classes of hetero-aromatic compounds with broad research and industrial applications in the field of medicinal chemistry, dye, chemosensor, photo catalysis, solar cell and photovoltaic applications.[1,2] All the synthetic methods reported for their synthesis so far mainly deal with construction of a new 6-membered ring through formation of any one or two bonds on suitably substituted pre-existing aromatic system.[3] In most cases, these aromatic precursors are not commercially available, often difficult to prepare, require multiple steps, often involve application of toxic heavy metals and ligands. We have developed a $FeCl_3$-alcohol catalyzed stepwise and one-pot general synthetic method for both diversely substituted acridines and acridinium ions directly from easily available 1,3-diketones, amines and aldehydes using molecular oxygen as terminal oxidant to produce water as the only by-product.[4] This ligand free approach has exploits high atom economy and diversity of multi-component reaction (MCR) to merge with a novel $FeCl_3$ catalyzed oxidative dehydrogenation to be the first synthesis of acridine and acridinium ions from aliphatic precursors and hence provides an effective greener alternative to all reported synthetic procedures so far. The newly generated acridinium photo-catalysts generated from this methodology found to be very effective in carrying out many vital organic transformations with exceptional ease in minimal catalyst loading without requiring any expensive heavy metal complex photocatalyst. In this presentation I shall discuss about the advancement achieved in synthesis of acridinium based photo-catalysts and effectiveness of these catalysts for providing greener alternative to several vital organic transformations.



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FAST 2.0/OP/10

Two-step Conversion of Levulinic Acid from Biomass Derivatives Using Autogenous Catalyst and H-Mordenite Zeolite

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Abstract:

With the depletion of fossil fuels, the production of chemicals and fuels from renewable resources, such as biomass, is gaining momentum. Researchers across the world developing several strategies and catalysts for the production of platform chemicals such as 5-Hydroxymethyl furfural (HMF), Furfural, Levulinic acid (LA), lactic acid. A stable and sustainable catalyst/process improves the process economics. In the levulinic acid or acetic acid production from hexoses, the formic acid forms in equal mole ratios. The formed formic acid can act as an (autogenous) catalyst in the cellulose hydrolysis. This study highlights the two-step conversion of cellulose to levulinic acid with formic acid and HMOR as a catalyst. The major highlight of this study was the utilization of higher cellulose:solvent ratios (up to 1:1 w/w) while maintaining the higher yields of LA. The role of the salting agent in the cellulose hydrolysis process was examined in detail. The two-step process exhibited a 3-fold increase in the LA yield and a 4-fold decrease in acetic acid and lactic acid. At optimal reaction conditions, a maximum yield of 65% LA was observed. The reaction steps in the formation of LA and acetic acid were discussed in detail.

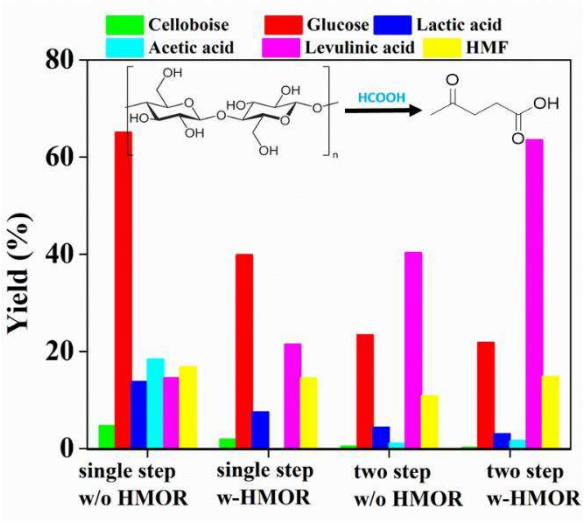

Figure 1: Effect of single and two-step process on conversion of cellulose to levulinic acid in the presence of formic acid and HMOR

FAST 2.0/OP/11

Design of Environmentally Benign Nano-Lignin Sol for Different Applications

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Abstract:

Biomass has become an important source of raw material for designing functional materials. Biomass is mainly composed of cellulose, hemicellulose, and lignin. Novel methods are needed to commercialized lignin as it has a heterogenous structure. In other words, the lignin structure is dependent on the source. In this paper, we will detail report novel methods of lignin-based material structures. Some examples of beneficial usage of lignin are bioplastics, nano-particles, and coatings. Detailed particle size analysis, microstructure analysis, and mechanical property analysis will be presented for these novel structures.

FAST 2.0/OP/12

Biochemical Composition and Nutritional Value of Small Indigenous Fish species Amblypharyngodon mola from Kokrahjar, Assam, India

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Absract:

Fish food had been a point of investigation for different authors in different parts of the world. But the complete nutritional profile of the fishes are not documented to the large extent. The present study was undertaken with an objective to focus on the potent qualities of the nutrients of small indigenous food fish, Amblypharyngodon mola (Hamilton, 1822). The chosen fish species are mostly available and widely consumed by the local people especially the poor. The detailed investigation inferred that the fish species is rich in protein (15.43%), moisture (71.50%) but having a lower content of lipid (2.94%). The amino acid composition resulted in lower amount of twenty amino acids with the highest content (10.83%) of L-Methionine was recorded. The studied fish species was found to contain a comparatively lower amount of fatty acids. The studied fish was estimated to be rich in the important minerals viz. Ca (731.10mg) and P (1.99gm). The study revealed that the fish species are enriched with nutritional contents and is highly recommended in the regular diet of human beings with special reference to the removal of malnutrition and as a good source of income for the poor peoples.

Key words: -Nutritional profile; food fish; amino acids; fatty acids; minerals; vitamins

FAST 2.0/OP/13

Towards the upgrading of lignocellulosic biomass: An efficient approach for the synthesis of bio-fuel intermediates over γ-Alumina Supported Sodium Aluminate

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Abstract:

Synthesis of value-added chemicals from simple molecules originating from biomass is of great interest today. Herein, we presented a simple and green approach for the synthesis of γ-Al_2O_3 supported sodium aluminate (SA) catalysts for aldol condensation of furfural with acetone. The SA/γ-Al_2O_3 was characterized by different techniques such as TPD, XRD, TGA, BET, SEM, and FTIR analysis. The effect of SA loading, catalyst conc., mole ratio, reaction time, and temperature on product distribution are investigated. The 25SA/γ-Al_2O_3 demonstrated highest conversion of furfural (99.5%) with 90% selectivity to 4-(2-Furyl)-3-buten-2-one (FAc) under mild conditions. The catalyst 25SA/γ-Al_2O_3 surpassed the activity of state of the art materials reported for this transformation. The textural properties of SA/γ-Al_2O_3 are in good correlation with the observed catalytic activity of the material. This remarkable activity of the material is ascribed to its intrinsic properties such as the distribution of active sites over the high surface area, amount of basic sites, and inherent mesoporosity. Various materials have been screened to compare the catalytic activity of 25SA/γ-Al_2O_3. The catalytic activity of 25SA/γ-Al2O3 is superior among the screened materials. On top of it, recycling experiments have proven that the material is stable and resistant towards the leaching of active sites.

Biography: Kempanna Kanakikodi received his master's degree in Chemistry from Rani Channamma University in 2014. He is currently pursuing his Ph.D. from Manipal Academy of Higher Education (MAHE), Manipal, India. His research is focused on the designing of heterogeneous catalysts for the conversion of renewable platform molecules into fuels and chemicals. To his credit he has 5 publications in reputed international journals.

FAST 2.0/OP/14

Effect of Wettability on Vacuum-driven Bubble Nucleation

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Abstract:

In this experimental study, the effect of wettability on the incipiation of vacuum-driven bubble nucleation and the subsequent rate of evaporative cooling are studied. Three glass vials of different degrees of hydrophobicities were prepared using chlorinated polydimethylsiloxane (CM), chlorinated fluoroalkylmethylsiloxane (CF), and (heptadecafluoro-1,1,2,2-tetrahydrodecyl)triethoxysilane (HT). The hydrophobic vials and one untreated vial that is inherently hydrophilic were used individually for nucleation experiments. The hydrophilic and hydrophobic glass vials were filled with degassed deionized water, and placed inside a transparent vacuum desiccator. The vacuum was increased in one inch steps and kept at each vacuum level for 15 minutes to observe bubble nucleation inside the vials. The average onset vacuum for gas/vapor bubble nucleation on CF, CM, and HT vials were found to be 2.7 ± 0.8, 2.8 ± 1.2, and 2.5 ± 0.7 inHg vacuum, respectively. During the vacuum boiling, the average temperatures of water in hydrophilic, CM, CF, and HT vials were reduced from room temperature to 15.2 °C, 12.7 °C, 12.9 °C, and 11.2 °C, respectively, at 28 inHg vacuum. However, nucleation was not observed in hydrophilic vials even at 28 inHg vacuum level. These findings may be useful for developing wettability-based vacuum boiling technologies.

Keywords: Bubble nucleation, Wettability, Hydrophilic, Hydrophobic, Vacuum boiling

Biography: Sushobhan Pradhan is a Ph.D. candidate in the School of Chemical Engineering at Oklahoma State University, Stillwater since 2016. He completed his bachelor's degree from Indira Gandhi Institute of Technology, Odisha, India in Chemical Engineering in 2014, and master's degree from Indian Institute of Technology Guwahati in Chemical Engineering with 'Petroleum Science and Technology' specialization in 2016. His current research interest includes surface chemistry, bubble nucleation, enhanced oil recovery and polymer technology.

FAST 2.0/OP/15

Green synthesis of ZnO nanoflowers using Oxalis corniculata extract

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Abstract

In the present work, for the first time, a well known Indian ayurvedic and medicinal herb Oxalis corniculata was used to synthesize zinc oxide nanoflowers (ZnO NFs) for the potential application in agriculture and cosmeceuticals. The main objective of the work is to explore the possibilities of Oxalis corniculata leaf extract to synthesize biomolecule functionalized ZnO NFs for the integration of green synthesis in nanomedicine that can leads to the development of biomedical products and help the society in a faster and safer manner. The prepared NFs were characterized using UV-Vis spectroscopy, Fourier transform infrared spectroscopy (FTIR), Thermogravimetric analysis (TGA), Transmission electron microscopy (TEM) andX-ray diffraction (XRD) method. Thebioactive compounds present in the leaf extract considered potential reducing agent, which mayresponsible for the formation of ZnO NFs. Flavonoids and related polyphenols as well ascarboxylate group present in the plant leaves is thought to be responsible for stabilization of ZnO NFs. Also, the nanoflowers are held apart from each other by the electrostatic repulsion that exists due to the presence of like charges surrounding the ZnO NFs. The results of the present study demonstrated that O. corniculata extract has great potential for the synthesis of other metal/metal oxide nanoparticles with biomedical and therapeutic applications.

Keywords- Zinc oxide, Nanoflowers, Biomedical, Cosmeceutical and Flavonoids

FAST 2.0/OP/16

A broad review on Arginine and its application in dentistry

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Abstract:

Dental caries, a dysbiosis-regulated biofilm-mediated disease, is an important health problem impacting almost half of the world's population. Insights from the Human Microbiome Project reveal that microbial ecological balance in human biofilms is essential for health. Not surprisingly, there has been an increasing interest in therapeutic interventions that modulate the microbiome of biofilms to restore this balance. Recently developed strategies focus on ecological approaches which use either antimicrobial strategies or approaches to enhance the growth of health-promoting bacteria. With one such being Arginine, a semi-essential amino acid found in the human body. Arginine was first isolated in 1886 from yellow lupin seedlings by a German chemist Ernst Schulze. During early in vitro studies around 1979-1983, Kleinberg identified arginine as the main salivary component responsible for the pH-raising effect of saliva, even in the presence of carbohydrates. Arginine metabolism via the arginine deiminase pathway (ADS) produces alkali in the form of ammonia that counteracts the effects of biofilm acidification. This article aims to review the knowledge gained from laboratory and clinical studies that support a significant role of arginine metabolism in the ecological balance of supragingival biofilms, inhibition of caries and also to report its promising clinical applications in dentistry.

Bibilography:

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FAST 2.0/OP/17

A low-cost rechargeable battery with aluminum and graphite

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Abstract:

Despite being the frontrunner in the league of rechargeable batteries, the future of all types of Li-based batteries is critically debatable due to severe declination of Li-based minerals. Considering the possibility of upcoming shortfall, there are global discussions and unprecedented search in both academia and industries for alternative and sustainable battery chemistries based on materials with greater earth-abundance than lithium. A rechargeable battery based on aluminum is envisioned to be a low-cost energy storage platform considering aluminum as the most abundant metal in Earth's crust. However, a rechargeable aluminum battery also requires an electrolyte and a cathode. As a low-cost and green material, graphite is a promising material as cathode in aluminum battery. But it is found that pristine graphite shows poor electrochemical performance. On the other hand, few layer graphene shows remarkable performance. Hence, an electrochemical method is employed to achieve self-standing graphene foam electrodes from graphite foil. These graphene foam electrodes were investigated as cathode in aluminum battery and it demonstrates excellent performance. In this presentation, the electrochemical performance of an aluminum battery with graphene foam electrode will be discussed [1].

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FAST 2.0/OP/18

A sustainable approach of tuning Potato waste towards Bioethanol production using Indigenous microbes of Himachal Pradesh, India

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Abstract:

The present research focuses on utilizing potato waste as a substrate for bioethanol production with the help of the novel, amylase-producing and thermo-tolerant Acinetobacter sp. The Physico-chemical properties of waste potato peel were 86% starch, moisture content of 75%, glucose content of 53mg/100g, dry matter of 25 % and 1% protein content. Among 25 microbial colonies, isolated from soil samples of high altitude locations of HP, India, five isolates (AP-1, AP22, AP-17, AP-4, AP-5) shown amylase producing abilities revealed through the starch hydrolysis tests with the optimal efficacy between 6.0 - 8.0 pH and 30^{o}C-50^{o}C. A Thermo-tolerant Acetobacter sp. (Isolate Ka1S) (isolated, characterized among 36 hot spring water samples of HP, India) was further utilized for bioethanol production studies. A non-linear regression model was developed and optimized for potato peel-based bioethanol production with an R^2-value of 99.11 %. It also drew the interactions among different input variables with the aid of three-dimensional response surface plots. The optimal ethanol yield of 5.83 g/L was obtained in 55.27 min at 27 ^{o}C using 38.8 % substrate concentration, inoculation volume of 7 % with pH 5.45. Overall, the present study showcases sustainable green energy (bioethanol) production utilizing potato feel waste as a substrate.

Keywords: Potato peel Waste; Sustainable approach; Bioethanol; Thermotolerant; Acinetobacter sp.

FAST 2.0/OP/19

An Invasive Weed Optimization coupled Biomass and Product Dynamics study of Soyabean Waste utilzation towards Fungal Lipase Production

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Abstract:

Soybean husk is the major waste in Indian state of Madya Pradesh which constitutes the 50 % of Indian soybean oil production with the waste tinges of 3.8 kg husk/Kg of oil. The soybean husk usually burnt (after small fraction use as animal feed) which is responsible for various environmental concerns. The present study aims at the utilization of waste, soybean husk for enhanced microbial lipase production through integrating the invasive weed optimization with biomass and product dynamics study. The invasive weed optimization constitutes based on the non-linear regression model results in a 47 % enhancement in microbial lipase production using the optimization parameters of 7% Sigma_Final, 9% exponent; Smax of 5 with a Max population size of 35 and Max. generations of 99. The $\mu_{max,}$ X_{Lim}^{st}, R_{Fin} values of biomass dynamics study are found to be equal to 0.0239, 8.17 and 0.852, respectively. The product dynamic studies reveals the kinetic parameters of k^{st}, k^{div}, P_{Fin} which seems to be equal to the -0.0338, 0.0896 and 68.1, respectively. Overall, the present study put forth the waste (Soybean husk) to wealth approach through the utilization of technological skills (Invasive weed optimization) and metabolism aspects (Biomass and product dynamics).

Keywords: Soybean husk**,** Microbial lipase, Invasive weed optimization, Biomass and product dynamics

FAST 2.0/OP/20

Purification of Crude Bentonite Clay, Characterization and Base Catalytic Application of Cu-Modified Bentonite Clay

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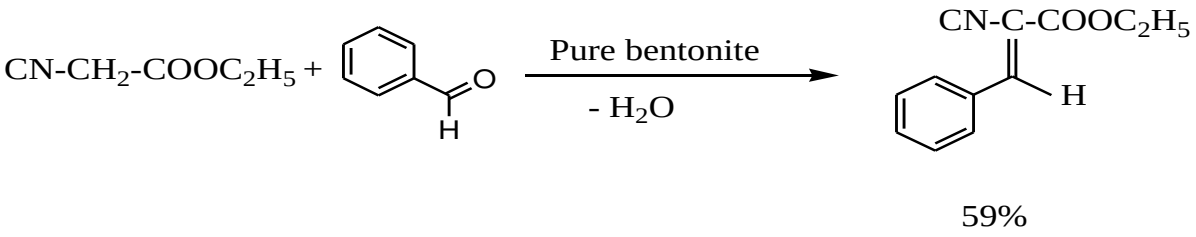
Abstract:

Commercially available bentonite clay was purified by stirring, siphoning and drying method, and then modified the purified clay by incorporating Cu^{2+} ion into the interlayers of bentonite clay. The Cu incorporated bentonite was prepared by adding freshly prepared Cu(OH)2 to purified bentonite clay followed by centrifugation, washing and drying. This modified bentonite clay was characterized with the help of FT-IR, Surface area analysis and SEM & EDX techniques. Employed this Cu- bentonite as heterogeneous catalyst in the knoevenagel reaction, yield was calculated.



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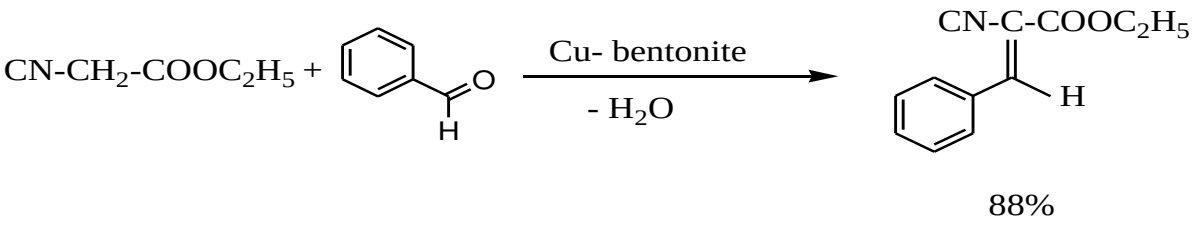

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FAST 2.0/OP/21

Adsorption of Industrial Dye from Its Aqueous Solution by Acid Treated Bioadsorbent White Frangipani

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The university is approved by the All India Council for Technical Education (AICTE) and recognized by the University Grants Commission (UGC).

Abstract

In this study, we describe sulphuric acid treated white frangipani leaves powder (SWFLP) as bioadsorbent for the adsorptive removal of cationic dye, Methylene blue from its aqueous solution. The characterization of the bioadsorbent was discussed by scanning electron microscopy (SEM EDX), Fourier transform infrared spectroscopy (FTIR), thermo gravimetric analysis (TGA) and contrast electron microscopy. Potential capabilities of the adsorbent have been evaluated by studying some experimental parameters such as solution pH, adsorbent dosage, initial dye concentration, contact time and temperature. The kinetic study has been achieved by the application of pseudo-first and second orders. The results showed that sulphuric acid modified white frangipani leaves powder (SWFLP) is a promising alternative for the biosorption of cationic (MB) dye from aqueous solutions.

Keywords: White frangipani, Potential capabilities, Electron microscopy, kinetic study, Biosorption.

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FAST 2.0/OP/22

Controlling and stabilization of Ru nanoparticles by tuning the nitrogen content of the support for enhanced H_2 production through aqueous phase reforming of glycerol

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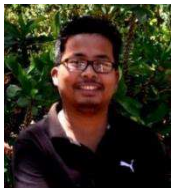

Abstract:

Stable activity of catalysts is an important issue in aqueous phase reforming of renewable oxygenates, of biomass origin, to get H_2. Sintering of metal nanoparticles on supports affects catalyst stability. To alleviate this problem, a series of highly stable Ru supported catalysts with controlled metal nanoparticle sizes have been prepared via incipient wetness impregnation method. These catalysts were used for APR of glycerol to produce H_2. Nitrogen doped mesoporous carbons (NMCs) were utlized as supports and found to have a strong influence on the catalytic performance of the catalysts. Incorporation of nitrogen in the carbon framework significantly enhanced the catalytic activity compared to Ru catalysts on nitrogen free supports. Nitrogen in the carbon framework has a duel relationship with the activity of the catalyst; (i) it creates basic environment over the catalysts support and (ii) it acts as an anchoring site for metal nanoparticles. Anchoring of metal nanoparticles has helped to curb their sintering, thus leading to better stability of the catalysts under APR reaction conditions. Density functional theory (DFT) calculations were helped to gain further insight into the enhanced catalytic activity of the catalysts.

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FAST 2.0/OP/23

Optical, Transport and Magnetic behavior of Ca-modified new double perovskite

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Abstract:

The conventional solid-state route method was adopted for the synthesis the new double perovskite $Ba_{1.5}Ca_{0.5}FeVO_6$. The well defined XRD peaks different from raw chemicals suggest the formation of single-phase new compound. Different vibrational modes such as stretching and bending as well as functional groups associated with the compounds was studied through Raman and Fourier transform infrared (FTIR) spectroscopic technique. The optical sensitivity and bandgap of the material were studied through UV-Visible spectroscopy. Dielectric properties of the material were investigated by analyzing the dielectric variation with frequency while impedance and modulus technique were utilized for electrical characterization. The identification of ferromagnetism in the material at room temperature was done through magnetization study.

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FAST 2.0/OP/24

Preparation and characterization of Chitosan based biocomposite thin films using Tectona grandis as an active component

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Abstract

Chitosan has been widely investigated as a biopolymer from renewable marine resources and it finds potential application in different fields due to its inherent properties such as biocompatibility, bioactivity and environment friendliness. In order to widen the versatility of its' application areas, chitosan has been incorporated with various inorganic and organic compounds to improve its physicochemical properties. On the other hand, natural extracts have long been proved to have enormous biomedical benefits and these may be used to improve the properties of a biopolymer by forming composites. The objective of the current study is to prepare chitosan based thin film composites (TFC) incorporated with Tectona Grandis leaf extract (LE) and wood flour extract (WFE) at different compositions (5, 10, 15 % w/v) by solution casting method. The films were examined for mechanical, thermal and barrier properties and were characterized by FTIR, SEM, TGA, DSC and UV-Vis spectroscopy. The results showed that incorporation of both the extracts improved mechanical and UV barrier properties of the chitosan films. Also, the thermal parameters of the films were enhanced. These eco-friendly prepared films are cost effective and can be used as a food packaging material.

Keywords: Chitosan, biocomposites, films, natural extract

FAST 2.0/OP/25

Green Synthesis of Fatty Acid Methyl Esters through Entrapped Lipase-mediated Transesterification

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Abstract:

The chemical-mediated transesterification of oils to FAME's is one of the commercialized biofuel product with the negative foot prints of GHG's on the environment and of DSP steps on the process economy. The present study aims at the development of green synthesis of FAME's through entrapped-lipase mediated transesterification of Indigenous Plant oils (Mahwa, Pongamia, Rice bran, Fried oil) of Orissa and West Bengal, India. The green synthesis of FAME's has been executed through the taking care of the alcohol molarity, reaction time, water addition, temperature, agitation speed, immobilized enzyme amount and reusability of immobilized enzyme. The optimal molar conversion of 58.24 %, 55.42 %, 47.84 % and 40.43 % has been observed for mahwa, pongamia, rice bran and fried oils respectively with more than 95% yield of FAME's. The immobilized enzyme has been reused up to 5, 7, 4 recycles for pongamia & mahwa, rice bran and fried oil FAME's with retaining 95 % relative activity. The green synthesized FAME's fuel properties (calorific value, pour point, flash point and kinematic viscosity) were determined and compared with the ASTM standards. Overall, the present study put forth the Green (Lipase) synthesis coupled Immobilization (technology) for FAME's production in a sustainable way.

Keywords: Green synthesis, FAME's, Entrapped Lipase, reusability, sustainable.

Biography: Dr. Garlapati obtained his PhD Degree in Bioprocess Engineering and Biofuels f from IIT Kharagpur, India. He is a recipient of A4U Post Doctoral Fellowship, Institute Fellowship, IIT KGP. He has been authored 50 research articles and 25 book chapters. Presently, he is working as a faculty member in Jaypee University of Information Technology, HP, India. His research interests include Bioprocess Engineering, Biocatalysis, Biofuel/ Bioenergy, Industrial/Environmental Biotechnology, and Food/Microalgal technology.

FAST 2.0/OP/26

Magnetically active $CuFe_2O_4$ as heterogeneous catalyst for the synthesis of pyrido[2,3-d]pyrimidines, 1,2,3-triazoles and 3, 5-diaryl-1H-pyrazoles

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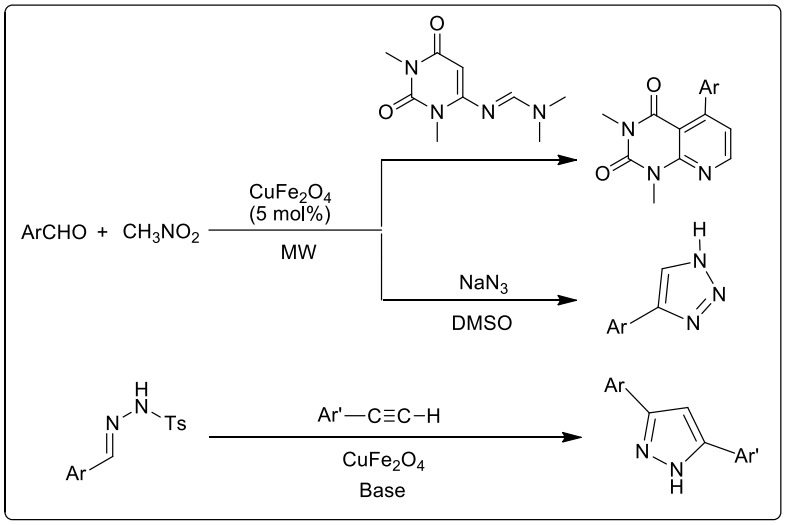
Abstract:

In recent years, magnetically active $CuFe_2O_4$ particles have been found widely and successfully used in many organic transformations.[i] Our research group has also been trying to exploit the catalytic property, easy recovery and reusability of this substance to develop synthetic methodologies for biologically important N-heterocycles. In the process, we have developed $CuFe_2O_4$ catalyzed three component synthetic methodologies for pyrido[2,3-d]pyrimidines and 1,2,3-triazoles as well as a two component methodology for 3, 5-diaryl-1H-pyrazoles. The catalyst system was prepared following the procedure described by Dandia et al.[ii] with a little modification and was characterized using FT-IR, XRD, SEM-EDX, TEM and XPES analysis. Our work to be presented can be summarized as below.



Scheme: $CuFe_2O_4$ catalyzed synthetic methodology for N-heterocycles

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FAST 2.0/OP/27

Advanced Materials for Vertically Aligned Liquid Crystal Displays

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Abstract:
Vertically Aligned Mode Liquid Crystal Displays (VA-LCDs) are excellent due to their low transmission dark state resulting in high contrast ratio and their intrinsic technology, which delivers perfect viewing angle characteristics. In the last two decades, the use of organo-fluorine compounds has gained considerable importance both in the field of Liquid Crystal Display (LCDs) devices [1]. An important class of materials satisfying the requirements of VA mode technology is the laterally fluorinated biphenyls and terphenyls [2] where the transverse dipole moments impart a negative dielectric anisotropy; the easy axis of the nematic director is aligned normal to the surface. Much attention is paid to fluorinated nematogens, because they often have broad nematic mesophases ranges, low rotational viscosity and low conductivity [3]. The liquid crystal molecules have to satisfy a complicated interdependent set of material properties as far as their applicability in display devices is concerned. Since, no single liquid crystal compound can fulfill all the above-mentioned requirements; a mixture comprising of up to 10-15 components has to be formulated whose physical properties have to be optimized to fulfill the LCD manufacturer's requirement. This work highlights the systematic development of a fifteen component mixture from pure liquid crystalline compounds comprising of laterally fluorinated bi-, tri- phenyl, tolane, bicyclohexane compounds and non-mesogenic compounds. The temperature dependence of birefringence, dielectric anisotropy, threshold voltage, bend elastic constant, relaxation time and rotational viscosity as a function of temperature of this fifteen component nematic mixture have been reported. This mixture exhibits a high Figure of Merit (FoM) which is desirable for reducing the device response time. In addition orientational order parameter (OOP) values, activation energy (E_a), visco-elastic co-efficient (γ_1/K_{33}) and material parameters (A_0) have also been calculated to ascertain the applicability of this material in Vertically Aligned Mode Liquid Crystal Displays. The effect of pretilt angle in the alignment layers on the threshold voltage and switching time has also been discussed.

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FAST 2.0/OP/28

Experimental Investigation of Biosurfactant with Nanoparticles for Enhanced Oil

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Abstract:

Although fossil fuels are marred by the controversies like increase in greenhouse gas emissions, geopolitical uncertainties, price fluctuations in the production and market caps, possible replacement by renewable alternatives, and more, crude oil will certainly be a major source of energy for many more years to come. Therefore, the significance of innovative enhanced oil recovery (EOR) techniques is the need of an hour. In this regard, nanoparticles (NPs) and green chemicals such as biosurfactants (BS) have been proposed for EOR applications. Environmental friendly nature, biodegradability, and stability at extreme environmental conditions, are few advantages of biosurfactants. Smaller size (1-100 nm) and higher 'surface area-to-volume' ratio of NPs enhances the mass transfer and alters fluid-rock interface properties. In current study we studied silica NPs (60-70 nm) and different types of BS (lipopeptides and glycolipids) for EOR applications, under oil field conditions using Berea sandstone core plugs. Silica NPs alone showed ~10-30% AOR, at different concentrations (40-250ppm), but significant increase in back pressure was observed. NPs (40ppm) in combination with BS (500 ppm) showed ~ 10-25% AOR, with back pressure under control. Such combination of 'BS: NP' showed quite promising EOR applications and could replace toxic chemical surfactants in a longer run.

Biography:

Dr. Sanket Joshi is a Deputy Director, Oil & Gas Research Center, and an Application Specialist, Oil & Gas Science at Sultan Qaboos University, Oman. He holds BSc and MSc degrees from Sardar Patel University, India, and a PhD degree from M. S. University of Baroda, India – all in Microbiology. Dr. Joshi has academic teaching and research experience of about 16 years, and Biotechnology Industrial R&D experience of about 4 years, in India and Oman. His current research interests encompass: Energy (Enhanced oil recovery and biofuels), Microbial products, and Environmental Bioremediation. Since he joined SQU, his research team has received over 4.0 million USD in research grants and contracts. He has about 122 scientific publications in international journals, book chapters, and conference proceedings, and two international books to his credit. He is an Academic/Associate/Guest Editor for some of the highly reputed journals: Frontiers in Microbiology, PeerJ, Ecotoxicology (Springer), Petroleum Science and Technology (Taylor & Francis, UK), 3 Biotech (Springer), Open Biotechnology Journal, Sustainability and Scientifica. Dr. Joshi was 34th in SQU among top 500 authors (based on number of citations 2009-2018, as per SciVal-SCOPUS/Elsevier), with 2193 citations, h-index of 25, and i10 index of 35 Google Scholar).

FAST 2.0/OP/29

Fabricating Green ZnO Nanoparticles Using Aqueous Extract of Coconut Husk for Photocatalytic Activity

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Abstract:

Current work addresses a study of highly photoactive zinc oxide nanoparticles synthesized using different amounts of coconut husk ash water extract as a precipitating agent in a green approach which is a potential source of natural alkaline media. Zinc oxide nanoparticles were synthesized by co-precipitation method at room temperature using zinc nitrate as a source of zinc ions. The formation of zinc oxide nanoparticles at different pH of the solution of coconut husk ash was confirmed through powder XRD, SEM-EDX, UV-Vis, FTIR and Photoluminescence spectroscopy. The photocatalytic performance of the samples was evaluated through the degradation of Methylene Blue under solar irradiation which undergoes degradation around 98% within 120 min. The high photocatalytic activity and rate constant could be attributed to the large surface area due to small particle size that could provide quicker photon absorption and reduction of charge carrier recombination. This current work introduces a new method to reduce energy consumption for the synthesis of highly photoactive low-cost zinc oxide nanoparticles in a green approach.

Keywords: Photocatalysis, zinc oxide, coconut husk ash, methylene blue, rate constant.

Biography: Dr. Manasi Buzar Baruah is currently working as assistant Professor in the Department of Physics, Central Institute of Technology Kokrajhar, Assam, India. Dr. Baruah's current research interest is green synthesis of nanoparticles and diverse application of such fabricated materials.

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FAST 2.0/OP/30

Ethnic Food Beverages: Identification of Sustainable Compounds

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Abstract:

Traditional beverages, whether alcoholic or non-alcoholic, are being used as food in many parts of the globe viz., Sake in Japan, Dolo in Africa, Moutai in China etc. These are rich in compounds like ethanol, antioxidant molecules (flavonoids, polyphenols), and other volatiles. The preparative steps of traditional beverages are almost similar, the three main steps being Brewing-Mashing, Fermentation and Decantation. Yeast culture preparation and addition may however vary for different countries. In North-East India especially in Assam, Jou (Joubidwi and Jougwran) is one type of highly consumed traditional beverage prepared by the vastly populated plain tribe, Bodos. This food beverage is a good source of antioxidants, high in ethanol content, rich in proteins as well as various minerals. Herein, we are reporting the presence of 20 volatile compounds in Jou using GC-MS and some antioxidant compounds by reverse phase HPLC techniques. A few compounds identified in Joubidwi and Jougwran are phenyl ethyl alcohol, azulene, butylated hydroxyl toluene, iso-propyl myrisate, 2,6,10-trimethyldodecane, dibutyl phthalate, 2,6,10,14-tetramethyloctadecane, methyl 13-octadecanoate and ethyl oleate, etc. Among the identified volatile compounds, the fragmentation of phenyl ethyl alcohol is shown in Figure 1. These compounds have positive bioactive properties like anti-microbial and antioxidant activity, food preservative property, pharmaceutical and cosmetic uses. Gallic acid, catechin, syringic acid, salicylic acid and protocatechuic acid are a few important antioxidant molecules identified in Jou.

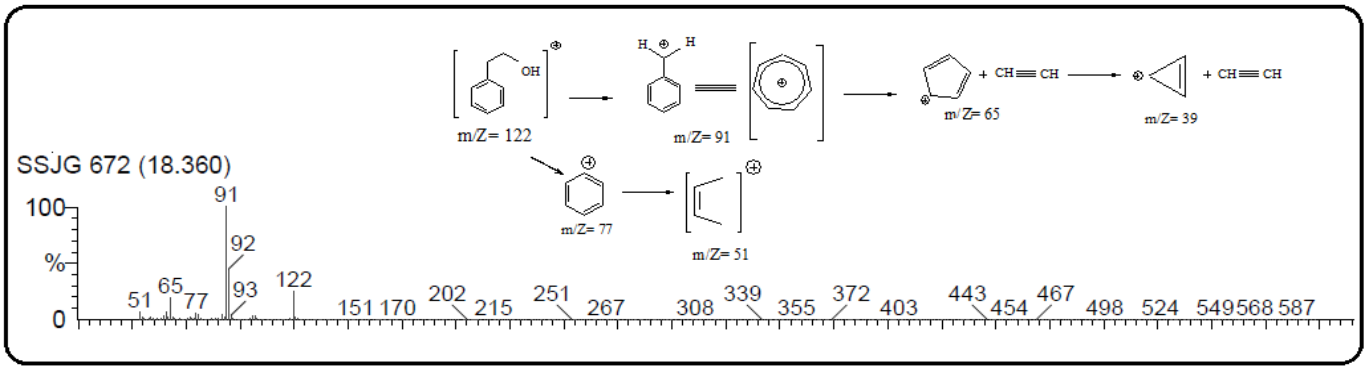

Figure 2: GC-MS fragmentation of Phenyl ethyl alcohol in Distilled beverage

Biblography: About presenting author, with a PhD degree from Gauhati University, Guwahati, Assam, India, Dr. Kalita Deka is working as Grade-II Assistant Professor in the Department of Chemistry, Central Institute of Technology (Deemed to be University, under MHRD, Govt. of India) Kokrajhar, Assam, India and working in the areas food beverage and natural products etc.

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FAST 2.0/OP/31

Charge-assisted Hydrogen bonds and Nitrile···Nitrile interactions directed assemblies in Coordination Complexes: Anticancer activities and Theoretical Studies

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Abstract:

The design and synthesis of coordination compounds involving organic ligands has attracted great attention due to their wide applications in catalysis, adsorption, magnetism, molecular recognition, nonlinear optics, and as sensors [1-2]. The selection of suitable ligands plays the decisive role for the construction of supramolecular assemblies of desired dimensionalities [3]. Among the non-covalent interactions, H-bonds are the most conventional supramolecular interactions that stabilize the network architectures of the coordination solids [4]. "Charge assisted" H-bonds are considered to be stronger and shorter compared to neutral H-bonds [5], wherein the H-bond donors and/or acceptors carry positive and negative charges respectively [6]. The nitrile fragment present in organic cyanopyridines is capable of exhibiting local dipole moment [7] and as a consequence, such organic moiety engages in dipole-dipole contacts and can serve as H-bond acceptors [8]. These interactions have received attentions in recent years for the experimental and theoretical chemists to explore new dimensions in crystal engineering.

As a part of our efforts to explore unconventional non-covalent interactions, we herein report Cu(II) and Mn(II) coordination complexes involving charge-assisted hydrogen bonds and T shaped nitrile···nitrile interactions in the crystal structures. We have further analyzed these unconventional interactions using DFT calculations, MEP, NCI plot and QTAIM computational tools. The in vitro antiproliferative activities of the compounds have been explored in DL cell lines considering cytotoxicity, apoptosis, molecular docking and pharmacophore features. No hematotoxicity was also recorded for the compounds after treatment in normal mice.

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POSTER PAPERS

FAST 2.0/PP/01

Biodiesel production using a renewable mesoporous solid catalyst

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Abstract:

Heterogeneous solid catalysts have been largely developed for biodiesel production, because of their attractive acid-base properties, strong hydrothermal stability, and efficient recovery/reusability. In this framework, developing bio-waste derived heterogeneous catalysts has attracted immense attention for several catalytic applications, owing to their inexpensive, non-toxic, acid-base, and recyclable/reusable properties. In the present work, we investigated the catalytic performance of biomass-derived orange peel ash (OPA), which contains a porous structure, as a raw heterogeneous catalyst for the transesterification of soybean oil to biodiesel. About 98% conversion of soybean oil to biodiesel was obtained under the optimized reaction conditions i.e., 6:1 methanol: oil ratio, 7 wt% catalyst loading, 7 h reaction time at the ambient reaction temperature, which ascribed to the presence of abundant basic sites in the developed OPA catalyst. The catalyst can be reused for five successive cycles and shows great stability towards the biodiesel production.

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FAST 2.0/PP/02

Synthesis, Characterization and application of $NiFe_2O_4$ – GO nanocomposite for the removal of Methylene Blue dye from aqueous effluent

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Abstract:

In this article, a $NiFe_2O_4$–graphene oxide ($NiFe_2O_4$–GO) nano-composite prepared by one step solvothermal approach and investigated the adsorptive removal of methylene blue (MB) from aqueous effluents by $NiFe_2O_4$–GO. The X-ray diffraction (XRD), scanning electron microscopy (SEM), Energy dispersive X-ray(EDX), Brunauer-Emmett-Teller (BET) surface area, X-ray photoelectron spectroscopy (XPS), Raman spectra, Zeta potential and thermogravimetric analysis used to characterize the adsorbent. The result satisfied the abundant of functional group and nanomaterials features. The adsorption of MB increases with increasing adsorbent doses, pH, temperature and initial MB solution concentrations. The adsorption kinetics fitted well to pseudo second order kinetics model with high correlation coefficient greater than 0.999. The investigation of intraparticle diffusion and Boyd's film diffusion model shows the rate-controlling step dominated by film diffusion at the beginning and then followed by intrparticle diffusion. The adsorption isotherm fitted well to Langmuir model in comparison to BET, Temkin, Freundlich and Dubinin-Radushkevich model. Thermodynamics studies suggest the spontaneity and endothermic nature of adsorption process. The adsorption advances through electrostatic attraction, π-π interaction and H-bonding. Reusability study reveals the prepared adsorbent is a cost effective and promising sorbent for high efficiency and excellent renewability.

Keywords: Adsorption, $NiFe_2O_4$ – GO composite, Methylene blue, kinetics, isotherm, Adsorption mechanism.

FAST 2.0/PP/03

Through Porous Medium Heat and Mass Transfer Flow Between Two Long Vertical Wavy Walls

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Abstract:

The study of two-dimensional free convective heat and mass transfer flow of a viscous incompressible and electrically conducting fluid in a porous medium confined between two long vertical wavy walls has been studied under the assumption that the wave length of the wavy walls are large. Consider that the wavy walls have different amplitude. A uniform magnetic field is assumed to be applied perpendicular to the walls in the absence of waviness.
The velocity field, temperature, concentration, skin friction, Nusselt number and Sherwood number for different values of the parameters involved in the problem are obtained. The dimensionless governing equations are solved analytically by using regular perturbation technique subject to the relevant boundary conditions and are presented graphically

Keywords: Nusselt number, skin friction, magnetic field, heat transfer, mass transfer, porous medium, velocity field.

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FAST 2.0/PP/04

Isolation of cellulose from fruit skins and it's utilization for fabricating novel cerium oxide nanocomposites

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Abstract:

Synthesis of any composite has been a part of trending research with varied chemicals and also by making use of clays, polymers and carbon sources. Here, we have utilized one naturally available abundant polymer which is non-toxic, biodegradable and possess eco-friendly route of extraction. Considering the amount of waste being discarded at fruit vendors after removal of juice, there exist large amount of hard fruit peels which are an extensive source of cellulose. To remove other contents like lignin and hemicellulose, chemical treatments were executed and purest form of cellulose was obtained. This cellulose in varied ratios was utilized in in-situ synthesis of cerium oxide nanoparticles via route of co-precipitation. The developed nanocomposites were characterized via X-ray diffraction and Raman spectroscopy for identifying the phase purity. FTIR was performed for the structural components present in cellulose as well as cerium oxide. Morphology and size were analyzed by FESEM, Zeta sizer and HRTEM. Thus, successful isolation of cellulose was done from left-over to fabricate valuable ceria nanocomposites which can be applied in sensors, photodegradation, adsorption of toxic pollutants and also in nuclear fuel. This synthesis will be beneficial to society due to its eco-friendly approach and as a concern for environment sustainability.

Keywords: Cellulose, ceria, nanocomposites, environment, co-precipitation

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FAST 2.0/PP/05

Environment friendly heterogeneous catalyst from waste plant for green synthesis of biodiesel

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Abstract:

The present study investigates the efficacy of heterogeneous catalyst derived from waste Heteropanax fragrans in biodiesel synthesis. The ash of H. fragrans (UHC) as well as ash calcined at 550 (CC-550) and 850 ^{o}C (CC-850) are utilised as catalyst in transesterification of Jatropha curcas oil to biodiesel. XRD, FT-IR, BET, SEM-EDX, XPS and HRTEM techniques were used in characterisation of the catalyst. Oxides and carbonates of metals present in the catalysts were revealed from characterisation where potassium was found to be dominating metal. The catalyst CC-550 with high pH (12.89 at 1:5 w/v) showed superior catalytic activity and resulted in higher biodiesel yield of 97.75% in 65 min under optimised condition of 12:1 methanol to oil molar ratio and 7 wt.% of catalyst at 65 ^{o}C. The catalyst (CC-550) is successfully reused up to 3rd cycle of reaction with a good yield of 90.22 %. The activation energy of the transesterification catalysed by H. fragrans catalyst found to be 32.31 kJ mol^{-1}. The produced J. curcas biodiesel is characterized by FT-IR, NMR and GC-MS technique. The H. fragrans catalyst is an environment friendly as well as cheap heterogeneous base catalyst with high efficacy.

Keywords: Transesterification, biodiesel, heterogeneous catalyst, Jatropha curcas.

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Enhancement of capacitive density in parallel plate nanocapacitors due to Coulomb Blockade Effect

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Abstract:

Capacitive density of microcapacitors can be modulated with nanostructured materials via the Coulomb Blockade Effect (CBE). In recent years, the dielectric properties (k and D) of multifarious nanostructured materials have been investigated for application as dielectric material in embedded capacitors. Here we demonstrate that the capacitive response of Ag/PVA nanocomposites on account Coulomb Blockade effect of nanostructured Ag particles is significant in comparisons to their bulk counterpart and the matrix. The findings regarding the variation of dielectric character on concentration of $AgNO_3$ and the circuit application of the fabricated capacitors are some important ingredient of this investigation.

Keywords: Coulomb Blockade Effect, Nanocomposites.

Biodiesel production from jatropha oil via transesterification reaction using a solid base catalyst from banana plant

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Abstract:

In this work, heterogeneous catalyst derived from waste banana plant is potentially applied in the transesterification of jatropha oil to biodiesel. The catalyst was characterized by XRD, FT-IR, BET, SEM-EDX, XPS and TEM. The reaction was carried out under optimum condition 9:1 methanol to oil molar ratio at 65 ^{o}C loading 5 wt% catalyst and 97.65 % of biodiesel was achieved in a very short time 9 min. The activation energy was found to be 47.56 kJ mol^{-1}. The catalyst was reused upto 3rd cycle resulting 91.23 yield % and the biodiesel was further characterized by FT-IR, ^{1}H NMR, ^{13}C NMR and GC-MS and its fuel properties were analyzed and meet with the international standard values as well as comparable with literature.

Keywords: Banana plant, biodiesel, transesterification, heterogeneous catalyst, Jatropha curcas.

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FAST 2.0/PP/08

Effect of Cu doping on crystal structure and optical properties of TiO_2 nanoparticles prepared by Sol-Gel technique

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Abstract:

Metal oxide nanoparticles play very important roles in many areas of chemistry, physics and material science. Among that Titanium dioxide (TiO_2) is a metal oxide which is inexpensive, in-toxic, highly photoactive and easily synthesized and handled. Here in this report, pure TiO_2 and various concentration of copper doped titanium dioxide (Cu-TiO_2) is synthesized by sol-gel technique. The effect of Cu doping on structural, morphological and optical properties of TiO_2 nanoparticles were investigated through various characterization techniques such as X-Ray Diffraction (XRD), Scanning- electron microscopy (SEM) and UV-visible absorption spectroscopy. The XRD spectra clearly show the anatase phase of pristine titania. The XRD spectra also demonstrate the formation of Cu-TiO_2 nano-composite in the matrix. The crystallite size from W-H analysis shows a decreasing trend with the increase of Cu^{2+} content and increase in strain with increase in Cu^{2+} concentration. SEM analysis shows the arrangements of the particles are in particular trend and of the sizes of about 50 to 100 nm. UV-visible absorption analysis shows that energy band gap of nanoparticles decreases with increasing Cu^{2+} concentration.

Keywords: Metal oxide nanoparticles, TiO_2, Sol-gel, XRD, SEM, UV-Visible absorption spectroscopy.

FAST 2.0/PP/09

Carbon quantum dots originated from banana stem for colorimetric detection of Hg^{2+} in aqueous media

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Abstract:

In this report, a chemical-oxidation method have been used to synthesize carbon dots (CDs) from banana stem to develop an effective colorimetric sensing platform for heavy metal ions. The synthesized method involves the oxidation of the carbonized source with a mild oxidizing agent H_3PO_4. The synthesized CDs were characterized by UV-visible spectroscopy, fluorescence spectroscopy, FT-IR, X-ray diffraction techniques and HRTEM. The HRTEM reveals that the CDs are well distributed with almost spherical morphology having an average size from 8 nm. Mercury is the most hazardous element that poses threat to ecosystems as well as human health even at very low concentration. The CDs are very much selective as a colorimetric probe for sensing mercuric (Hg^{2+}) ions in comparison to other metal ions. The interaction of other metal ions that includes alkali metals, alkaline earth metals and some transition metals with the CDs solution are also investigated. The solution of Hg^{2+} ions and CDs are diluted to different concentrations and the limit of detection of the CDs for the Hg^{2+} ions is found to be 70×10^{-6} M. Hence, one could get a clear insight of formation of CDs through a very simple green procedure without use of any harmful chemicals that could detect Hg^{2+} ions easily.

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FAST 2.0/PP/10

Synthesis and Characterization of PbS nanoparticles

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Abstract:

Lead Sulphide (PbS) nanostructures have attracted increasing attention, from the research community, in recent times due to their potential application in both traditional optical devices and new generation of Nano-electronic and Nano-optoelectronic devices because of their unique chemical and physical properties. In this present work a wet Chemical technique have been adopted to synthesize PbS nanoparticles. The precursors used here are Lead Nitrate ($Pb(NO_3)_2$))/Lead Acetate ($Pb(CH3COO)_2$) and Sodium Sulphide (Na_2S). Polyvinyl alcohol (PVA) has been used as a capping agent. Two sets of PbS nanoparticles have been prepared using two different matrix. In SET-I, PbS is synthesized by varying the concentration of non-conducting matrix PVA while keeping the reaction time constant (i.e 3 hrs). The PVA concentration has been changed from 0.25 gm to 2.0 gm in 4 different samples.While in SET-II, the concentration of conducting matrix PANI has been changed from 0.25 gm to 2.0 gm, keeping the reaction time constant at 3 hours. Finally the synthesized samples are characterized by using various characterization techniques such as UV-Vis Spectroscopy (UV), Photoluminescence Spectroscopy (PL), X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM) and Energy Dispersive X-RAY Analysis (EDAX).

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FAST 2.0/PP/11

Synthesis and Characterization of Biobasesd Polymeric Nanocomposites and its Application in Food Packaging

Sathya A B., Sivashankar R., Sreeda P., Santhiagu A., Sivasubramanian V.

Abstract:

PHA-based films have attracted interest for food packaging applications due to their renewability, biodegradability and potentially useful water vapor barrier properties. In particular, the properties of PHB can be compared with those of synthetic thermoplastics such as isotactic polypropylene (PP). Eventhough, the commercialization of PHB has been restricted by certain factors associated such as cost of production, brittle nature and poor thermal stability in the molten state which leads to a very narrow range of processing temperatures. These limitations can be avoided by enhancing the material properties through fabrication of nanocomposites. The rationale is that introduction of nanofiller into a polymer matrix can significantly modify morphology, thermal stability, crystallization behavior, mechanical and barrier properties, and biodegradation rate, all of which are relevant from the food packaging perspective. Zinc oxide (ZnO) nanoparticles have been identified as potential reinforcing fillers in polymer composites. Apart from the physical properties, ZnO also possess antimicrobial activity. Further, ZnO nanostructures are considered to be nontoxic and recognized as GRAS (Generally Regarded As Safe) by FDA. These properties reassure that ZnO is an appropriate candidate to be used in the food packaging. The nanocomposite with the ZnO filler studied has improved the properties by increasing the water barrier as well as the mechanical properties. Further the antimicrobial properties and minimum migration make it an appropriate candidate for use in food packaging. PHB/ZnO nanocomposites were successfully prepared and used as packaging materials for soft white cheese. First, ZnO-NPs were synthesized and were used to prepare nanocomposite films. The films were characterized using XRD, SEM, FTIR, UTM and degradability behavior was also analyzed. Moreover, soft white cheese was prepared and packed within the prepared nanocomposite films, and stored at 7°C for one month. When using nanocomposite films to pack the cheese, no significant changes was observed in soft white cheese on completion of the storage period compared with control treatment. Finally, it was found that the prepared bionanocomposite films incorporated with ZnO nanoparticles at different ratios exhibited good properties compared with the traditional polystyrene package, so it is concluded that the prepared bionanocomposite films can be used successfully as food packaging materials.

FAST 2.0/PP/12

An overview of strategies for remediation of environmental pollutants using novel nanomaterials for public health safety

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Abstract:

The ever-increasing world population has resulted in the exponential rise of industrial, transportation, and communication activities, ultimately leading to overexploitation and mismanagement of environmental resources. The consequences of environmental pollution have resulted in several short- and long-term chronic effects on soil, air, water, and biosphere, thereby development and deployment of methods of remediation of environmental pollution an urgent requirement. Nanotechnology enabled advanced materials offer treatment strategies with improved remediation efficiency, less energy and material consumption, and reduced harm to the environment than other available conventional techniques against a wide range of environmental pollutants. Based on morphology, dimensionality, magnetic properties, etc. nanomaterials have been classified into several classes including nanoparticles, quantum dots, nanowires, nanotubes, nanocomposites, and others. These materials play several important roles such as catalysts, additives, or adsorbents, alone or in combination with polymers, used for detection and degradation of pollutants present in the environment. Several classes of pollutants include metals and metalloids, radioactive materials, heavy metals, dyes, biocides, antibiotics, oil-spills, hydrocarbons, polyaromatic hydrocarbons, phenolic compounds, chlorinated hydrocarbons, volatile organic compounds, particulate matters, oxides of Carbon, Sulphur and Nitrogen, carbon soot, dioxins, polychlorinated biphenyls, and many other organic and inorganic compounds. The present article discusses the effect of environmental degradation on human health followed by conventional physicochemical and biological treatment strategies for remediation of environmental pollutants. Further, an overview of the synthesis, and types of nanomaterials, and their application in the degradation of various contaminants and the monitoring of pollutants have been presented in a comprehensive manner. In addition to this, the environmental fate and behaviour of nanomaterials have also been briefly discussed.

Keywords: Environmental Pollution, Remediation Strategies, Nanomaterials, Nanoremediation, Public Health

Biography: Lakhan Kumar works towards Environmental Sustainability. His interest areas include Bioenergy, Bioprocess Engineering, Algal Biorefinery, and Remediation of Environmental Pollutants. He has published several peer reviewed articles and book chapters majorly in biofuels and bioremediation. At present, he is pursuing his PhD in Biotechnology at Department of Biotechnology, Delhi Technological University, Delhi, India-110042.

FAST 2.0/PP/13

Organocatalytic Friedel Craft alkylation reaction: A rapid access to 11-indolyl-11H-indeno[1,2-b]quinoxalin-11-ol, symmetrical and unsymmetrical 11,11-diaryl-11H-indeno[1,2-b]quinoxaline using vitamin B_1 as an efficient metal free catalyst in aqueous medium

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Abstract:

An eco-compatible method for the construction of a variety of highly functionalized 11-(1H-indol-3-yl)-11H-indeno[1,2-b]quinoxalin-11-ol, substituted 11,11-di(1H-indol-3-yl)-11H-indeno [1,2-b]quinoxaline and unsymmetrical 11,11-diaryl-11H-indeno[1,2-b]quinoxaline derivatives in the presence of vitamin B_1 as inexpensive metal-ion free natural organocatalyst in aqueous medium at room temperature has been developed. As most of the waste during a chemical process is produces from volatile organic solvents, hence the use of water as the reaction medium makes the present protocol environmentally as well as ecofriendly benign. The practical utility of this method was found to be very efficient for scale-up reaction and another useful transformation. The significant advantages of the present protocol include mild reaction condition, short reaction time, simple work-up procedure, fast reaction, inexpensive, metal free, ligand free, waste free, column chromatography free, easily recoverable and reusability of catalyst, energy efficient, that could be applicable to a wide range of substrate scope. Products could be isolated by simple filtration and recrystallization with excellent chemical yields. To quantify the greenness and sustainability of the present protocol, several matrics like Atom Economy (AE), Atom efficiency, E-factor, Reaction Mass Efficiency (RME), Process Mass Intensity (PMI), and Carbon Efficiency (CE) has been determined and the obtained value clearly indicates the efficacy of the present protocol.

Bibliography:

Biplob Borah had graduated B.Sc. in Chemistry from Nowgong College, Assam in 2017 and received his Master's degree from Central University of Gujarat, in 2019. Currently he was joined as a Ph.D scholar in the School of Applied Material Science at the same university under the guidance of Dr. L. Raju Chowhan. His research interest includes organocatalysis, multicomponent reactions, green chemistry, synthesis of medicinally privileged heterocycles.

Modeling of gas turbine operated by municipal solid waste to obtain power, hot cooking oil and refrigeration

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Abstract:

In the present work gas turbine is operated by burning municipal solid waste(MSW)in combustion chamber in presence of air coming from compressor. The mass flow rate of MSW and air is adjusted in such a way that constant 1 MW power is obtained after combustion gas is passed through turbine. The exhaust combustion gas coming out from turbine after producing power is used for heating linseed cooking oil from 298.15 K to 393.15 K and amount of heating oil production decreases from 1:00 hour to 5:00 hours, increases from 6:00 hours to 15:00 hours and again decreases from 16:00 hours to 24:00 hours. The remaining exhaust gas coming out after heating cooking oil is used for heating generator of water-LiBr vapour absorption refrigeration system(VARS)maintained at generator and evaporator temperature of 70^0C, 12^oC respectively for cooling purpose. The condenser and absorber temperature are maintained at ambient temperature of Kolkata city, India for May(maximum temperature) and January(minimum temperature). The generator heating load and cooling load decreases from 1:00 hour to 5:00 hours, increases from 6:00 hours to 15:00 hours and again decreases from 16:00 hours to 24:00 hours for May and January with actual COP(coefficient of performance) of 0.211 and 0.48 respectively.

Keywords: COP(coefficient of performance),Gas turbine, Linseed cooking oil, Municipal solid waste (MSW), Vapour absorption refrigeration system(VARS)

Bibliography: Dr. Kamaljyoti Talukdar is presently an Assistant Professor at Department of Mechanical Engineering, Bineswar Brahma Engineering College, Kokrajhar, Assam. He completed his B.Tech in 2010 from Tezpur University in Mechanical Engineering. He completed M.E. from IIEST Shibpur,Kolkata in 2012 in Mechanical Engineering in Heat Power Engineering specialization. He completed Ph.D in Mechanical Engineering Department in Tezpur University,Tezpur,Assam in 2018.He has research interest in renewable energy, refrigeration and cogeneration.

Title: Role of Metagenomics in Tannery wastewater treatment and management: A review

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Abstract:

Treatment of Tannery wastewater is a worldwide concern. Tannery wastewater contains high concentration of chromium, organic, and sulfide content which causes heavy pollution to water and soil in contact. It hampers the soil fertility and quality. Also, aquatic ecosystems get disturbed and destroyed as heavy presence of pollutants in water hinders the penetration of sunlight and thus the photosynthetic efficiency of aquatic plants. Several treatment methods have been evolved with time to tackle the problem of tannery wastewater. Bioremediation is one of the most practiced, green and cost-effective method of treatment. Numerous microbes have been isolated and identified to have potential for degradation and deterioration of various pollutants. Identification and characterization of each microbe present in an environmental sample is a tedious job. Only culturable microbes have been isolated and identified. Some microbes are non-culturable as they only exist and survive in an environmental niche. For these microbes metagenomics is a boon. Ever since its advent, metagenomics has been extensively used in bioprospecting of microbes and derived products of industrial importance. Lately, its role has been investigated for identification of microbial populations having potential for remediation of various pollutants present in industrial wastewater. Metagenomics facilitates information on microbial community and their functional role present in an environmental sample. It helps in widening of our understanding of biodegradation mechanism; degradation pathways, microbes and their genes involved in bioremediation and thus can ultimately help in increasing the microbial remediation efficiency. In the present study, the role of metagenomics in bioprospecting of microbes, enzymes, degradation genes and pathways etc having potential for bioremediation of pollutants present in tannery wastewater has been discussed. An overview of tannery industries and their working is also presented. At the end, several tannery wastewater target pollutants and microbes having potential to degrade them have been discussed.

Keywords: Bioremediation, Environmental sustainability, Tannery wastewater, Metagenomics, Microbial diversity

FAST 2.0/PP/16

Antimicrobial Activity of Synthesized Gold Nanoparticle in synergy with antibiotics and its in-vivo Toxicity Assessment

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Abstract:
Prevalence of Salmonella ser. Typhi is often associated with disease outbreaks. Over use of antibiotics has led the emergence of resistance in these pathogens. The present work involves antimicrobial activity of synthesised Gold nanoparticles against Salmonella ser. Typhi in synergy with conventional antibiotics. Gold nanoparticles (AuNPs) were synthesized using biological approach and characterised by UV-visible spectroscopy and Electron Microscopy. The morphology of nanoparticles was spherical with size the range of 20-30 nm. Different combinations of AuNPs and antibiotics were found to be effective against Salmonella ser. Typhi. Micronucleus test of synthesized gold nanoparticles revealed that low and intermediate doses are non-toxic as compared to high dose. In-vivo studies revealed no mortality and morbidity at 400 mg/Kg body weight of Charles Foster rats. Present research work opens a new possibility for development of potential nanomaterials-based antimicrobial agent which may be an effective alternative to existing antimicrobials.

Keywords: Salmonella ser. Typhi, Drug-resistance, Gold nanoparticles and in-vivo toxicity.

Biography: Dr. Anurag Jyoti, Ph.D. is an Assistant Professor in Amity Institute of Biotechnology, Amity University Madhya Pradesh, Gwalior. He has obtained Master's degree in Biotechnology from the prestigious Indian Institute of Technology Roorkee in 2006 and Ph.D. in Biotechnology from CSIR-Indian institute of Toxicology Research, Lucknow in 2012. He has qualified joint CSIR-UGC JRF-NET in the year 2005. He has eight years of teaching and research experience and having 41 research papers to his credit. He has co-supervised one Ph.D. scholar for the award of Ph.D and presently two research scholars are pursuing Ph.D. under his supervision. Recently, he has filed one patent. Presently, he is the PI of a research project funded by MPCST, Bhopal. He has also authored 02 books and six book chapters. He has published 01 book in Apple Academic Press, USA as an Editor. He has presented papers in various National and International Conferences. Dr. Anurag is actively engaged in teaching, research and innovation. His research interest includes Nanobiotechnology and Environmental Microbiology. His team is actively engaged in the different dimensions of nanobiotechnology from synthesis of nanomaterials and its applications as antimicrobial agents to biosorption of toxic nanoparticles from environment using microalgae. Dr. Anurag has won Young Scientist Award of Madhya Pradesh Council of Science and Technology, Bhopal in 2013. He has been awarded with Young Scientist Award by SV University, Tirupati. Recently, he has been conferred on the WALL OF FAME of Amity Science Technology and Innovation Foundation. He has bagged Best Teacher Award by Dainik Bhaskar Group. Dr. Anurag is in the editorial board and reviewer of various reputed journals and has life membership of various International and National Scientific bodies.

Effect of reaction conditions on the photopolymerisation of some vinyl monomers initiated by N,N-Diethyldithiocarbamato-(1,2)-propanediol

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Abstract:

Controlled radical photopolymerization of some vinyl monomers through the use of N,N-Diethyldithiocarbamato-(1,2)-propanediol(DCPD) was studied. The vinyl monomers used here are 2-Hydroxyethyl methacrylate(HEMA) and acrylonitrile (AN).The photoinitiator DCPD was synthesized from sodium N,N-Diethyldithiocarbamate(NaSR) and 3-chloro-1,2-propanediol. The aim was to investigate the role of the monomer concentration, reaction time and DCPD to monomers mol ratio on the conversion of HEMA to PHEMA and AN to PAN. It was found that percentage conversion of HEMA and AN increased both with the rise in concentration of monomer and reaction time. In terms of the molar ratio of initiator and monomer, it was found that there was a critical molar ratio for maximum conversion. Further living radical nature of the poly2-Hydroxyethyl methacrylate (PHEMA) and polyacrylonitrile (PAN) were ascertained by the photo block copolymerization of methylmeth acrylate(MMA) with PHEMA and PAN to form PHEMA-b-PMMA and PAN-b-PMMA respectively.The resultant polymers were characterized by FTIR, ^{1}H-NMR, Thermogravimetry and SEM.

Keywords: Initiator ; photopolymerization ; block copolymers ; living radical ; thermogravimetric analysis(TGA) ; scanning electronmicroscope(SEM).

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FAST 2.0/PP/18

Direct Synthesis of Ortho-methylthio Allyl and Vinyl Ethers from Aryne Precursors

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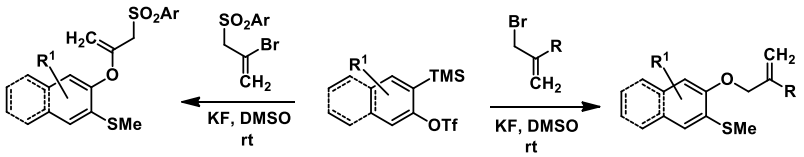
Abstract:

Transition-metal free synthetic strategies for the functionalization of arenes have emerged as a promising area of research in the field of synthetic organic chemistry. They continue to attract great interest as the functionalized arenes have been extensively used as fine chemicals for various applications.[1] On the other hand, aromatic thioether and vinyl ether moieties are important structural motifs found in biologically active molecules and natural products.[2] They have also been used as building-blocks for various drugs, organic materials and polymers.[3] Therefore, development of new synthetic strategies for installation of such versatile functionalities is important and highly desirable. Keeping this in mind, we have developed a synthetic strategy for the direct synthesis of ortho-methylthio allyl and vinyl ethers via three-component reaction of in situ generated aryne, activated alkene and DMSO. This reaction proceeds via several bond cleavage and bond formation processes in a single operation. This synthetic method provides a wide range of ortho-methylthio-substituted arenes in good yields.



Scheme 1: Synthesis of ortho-methylthio substituted allyl and vinyl aryl ethers

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FAST 2.0/PP/19

Fiber based geopolymer composites: A review

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Abstract

Geopolymers are a class of inorganic polymer that can be produced by the reaction between an aluminosilicate source material and an alkaline solution. Geopolymer materials have the potential for various engineering applications in different sectors, especially in construction industries. Depending on the raw material selection and processing conditions, these materials can exhibit a wide variety of properties such as high compressive strength, low shrinkage, thermal stability, high durability, low density, negligible shrinkage, chemical resistance, high surface hardness, fire resistance, microporosity, etc. but it also shows relatively low tensile, flexural strength. To emit these issues, the geopolymers are synthesized with various types of fiber. This present paper deals with the characterization of various types of fiber, synthesis and characterization of fiber-reinforced geopolymer composites, its structure, mechanical properties and thermal properties.

Keywords: Geopolymer; Fiber; Geopolymer composites; Mechanical properties; Thermal properties.

FAST 2.0/PP/20

Removal of Lead from water by using Limestone

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Abstract:

Lead is potentially toxic at very low exposure levels and has acute and chronic effects on human health. It is a multi-organ system toxicant that can cause neurological, cardiovascular, renal, gastrointestinal, haematological and reproductive effects. Therefore, WHO has prescribed guidelines values for lead in drinking water to 0.01 mg/l (10 µg/l). Therefore it is utmost necessary to remove lead if it is present in drinking water. Limestone is present in many parts of India, which has been utilized for the purpose of water purification. In this work preparation of hydroxyapatite from naturally available limestone and removal of lead by hydroxyapatite has been tried. The present work aims to establish a selective, rapid and simple lead removal 16procedure using a reaction between limestone and phosphoric acid from aqueous solutions and natural waters under the recommended conditions. Limestone based material can reduce concentration of lead below 0.001mg/L. The main parameters determined are the Pb concentration and pH of the water after treatment. The limestone samples were characterized by X-ray diffraction (XRD), Infrared spectroscopy (FTIR) and SEM-EDS.

Bibliography: Dr. Nath completed his doctorate in Chemistry from Tezpur University, Assam, India in 2011; where he did research on water treatment technology development. During PhD he contributed to the development of methods for fluoride and arsenic removal from contaminated water. Two methods namely FLUOIDE NILOGON and ARSIRON NILOGON are now being applied in the practical field of fluoride and arsenic affected areas of Assam and various places of India. Recently the methods are recognized by Indian Patent Office, Kolkata and two patents have been granted. After PhD Dr Nath worked in Nagaland University for few months as an ad-hoc faculty and from August 2012 he is working in Kokrajhar Govt. College, Assam India.

FAST 2.0/PP/21

Duel energy source producing Microbial Fuel Cells from molasses using Saccharomyces cerevisiae: An innovative approach.

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Abstract:

Energy, the prime mover of economic growth crucially depends on sustainable energy sources that are affordable, accessible and environmentally friendly. Microbial fuel cell (MFC) converts chemical energy from biodegradable materials into electrical energy. In the present work, a duel fuel energy MFC is constructed for both electricity and ethanol production, with simultaneous bioremediation of molasses using Saccharomyces cerevisiae.

Bio-treatability study shows highest substrate utilization at 60% molasses with highest biomass increase. The concentration was thus selected for MFC. MFC standardization was done for type of electrical circuit connection, environmental conditions, selection of electrodes and membranes, enhancement of electron transport and electricity: ethanol ratio.

The current was successfully amplified in the series combination using neutral red 100µM/l as electronophore. Maximum current of 9.4µA/l substrate was recorded. A sharp drop in current was recorded after sixth day reaction. Significant increase in ethanol concentration was observed only after discontinuing addition of electronophores. Reduction in COD (55%), BOD (40%), and reducing sugars (35%) showed substrate utilization by study organism thereby efficiency of the MFC setup for bioremediation too.

The study demonstrates the possibility of switching the conventional fermentation process for ethanol production to generation of electrical energy with a minute alteration of chemical environment of MFC.

Keywords: Microbial fuel cell (MFC), Saccharomyces cerevisiae, molasses, duel energy, bioremediation.

FAST 2.0/PP/22

De-aromatization of diesel fuel using Phosphonium based deep eutectic solvents

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Abstract:

In the current work, Phosphonium based deep eutectic solvents (DESs) have been synthesized for the dearomatization of diesel fuel at 298 K and atmospheric pressure. The low-cost DES based on a mixture of a hydrogen bond donor and hydrogen bond acceptor. The hydrogen bond acceptor namely Methyltriphenylphosphonium bromide (MTBP) along with Ethylene glycol (HBD) were taken in a ratio of 1:4 to synthesize potential DES. DES at molar ratio 1:4 was explored experimentally for the removal of benzene from a model diesel compound contains n-decane, n-dodecane and n-hexadecane. Ternary (liquid + liquid) equilibrium experiments were conducted at room temperature with benzene concentrations in the feed ranging from (2 to 20) wt%. ^{1}H NMR spectroscopy was used for compositional analysis of the extract and raffinate phases. No amount of the solvent in the raffinate phases was detected; indicating minimal cross contamination. Also, it was found that all systems exhibit Type I phase behavior with positive slopes which indicate that small amount of solvents is required to remove the benzene. Moreover, the distribution ratio and selectivity values are all greater than unity with higher values compare to reported in literature. COSMO-RS predictions of the ternary tie lines were in good agreement with experimental data with average RMSD value of 2.51%. The experimental data were also well correlated with NRTL model with average RMSD value of 0.60%.

Keywords: Deep Eutectic Solvent; Liquid-Liquid Equilibrium; Aromatic Hydrocarbon

FAST 2.0/PP/23

Methanesulfonate Anion Based Deep Eutectic Solvents Aided Thermal Dehydrogenation of Chemical Hydrides

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Abstract:

Hydrogen Fuel is considered globally as the new face of the energy sector because of its environment-friendly nature. The storage of hydrogen is a primary concern, and that is when chemical hydrides come into the picture. Owing to its high hydrogen content, amine borane complexes are the most promising candidate in chemical hydride family. These complexes are known to release a high amount of hydrogen with less residual products. Ammonia Borane (AB) and Ethylene diamine Bisborane (EDAB) are the most promising candidates in the chemical hydride family and are considered best for the dehydrogenation process. AB and EDAB are known to release 14 wt% and 10 wt% of hydrogen respectively. However, the disadvantages of AB are in the formation of borazine and ammonia during thermolysis[1]. EDAB, on the other hand, produces less wt% of H_2 but is less pollutant and shows the absence of an induction period, as well as the rate of dehydrogenation, which is faster than AB. The current work explores the comparison of Ionic Liquid and Deep Eutectic Solvent as reaction media for dehydrogenation. Initially, the quantum chemical-based COSMO-SAC (COnductor like Screening MOdel Segment Activity Coefficient) model was used for the selection of ILs. The following systems were considered namely : System 1: 1-allyl-3-methylimidazolium bromine, System 2: 1-butyl-3-methylimidazolium methylsulfate, System 3: tributylmethylphosphonium dibutyl phosphate, System 4: 1-butyl-1-methylpyrrolidinium methyl carbonate, System 5: 1-ethyl-3-methylimidazolium methanesulfonate. Methanesulfonate based ILs and System 6: 1-butyl-3-methylimidazolium methanesulfonate: Imidazole (figure 1). The latter is considered as a DES owing to the addition of Hydrogen Bond Donor namely Imidazole. The thermal dehydrogenation with measurement of equivalents from toepler pump (figure 2) were done with both EDAB and AB at 105°C for 7 hours at a vacuum of 4×10^{-2} mbar (gauge pressure). The residue was further used for ^{1}H NMR and FTIR analysis. The role of IL and DES as a catalyst cum solvent is confirmed by the ^{1}H NMR studies on the residual products.

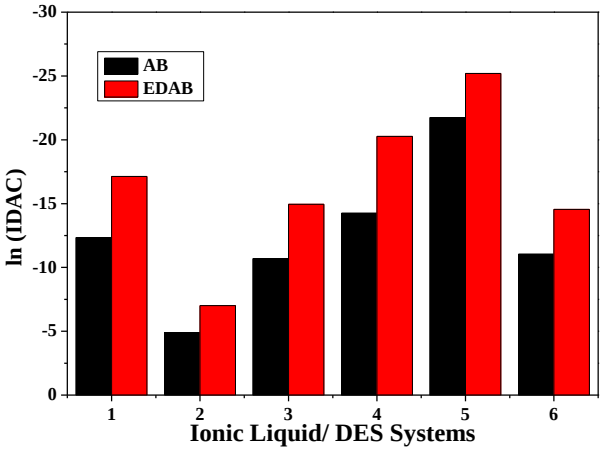

Fig. 1 Logarithmic value of infinite Dilution activity coefficient [ln (IDAC)] of AB (black) and EDAB (red) dissolved in ILs and DESs.

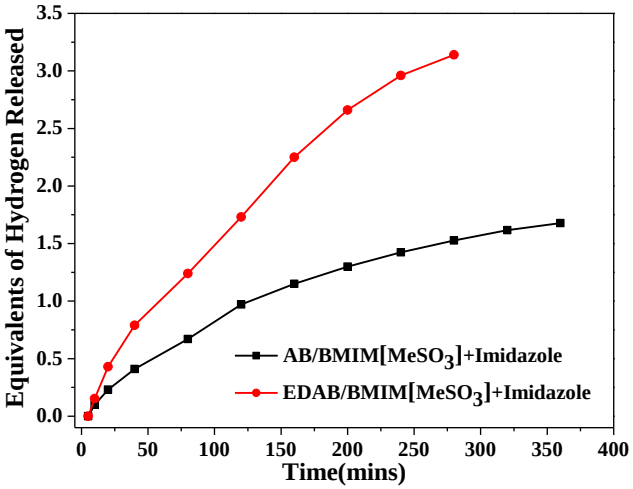

Fig. 2 Time-resolved equivalent hydrogen released from AB and EDAB dissolved in Methanesulfonate anion based DES

Keywords: Hydrogen Energy, AB, EDAB, NMR, DES

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Bibliography: Dhirendra Kumar Mishra is the corresponding and presenting author of the abstract, working as a Research Scholar in the Department of Chemical Engineering IIT Guwahati located in Assam, India working under the supervision of Prof. Tamal Banerjee and Prof. Gopal Pugazhenthi.

My Doctoral thesis emphasizes on Thermal dehydrogenation of amine borane complexes using green solvents such as ionic liquids and deep eutectic solvents with their molecular modelling and experimental findings

Theoretical Aspects of Some Ru- Vim Complexes

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Abstract:

Some Ru-VIm complexes were considered and their one electron redox potentials were analysed. The structures and the influence of the ligand in these ruthenium complexes on the one electron transfer mechanism were investigated. Ligand charge transfer towards the Ru metal from the ligand has been found prominent in these Ru-VIm complexes which confirm the formation of strong coordinate bond with the metal Ru. The one electron transfer processes of these complexes depend on the number of VIm ligands present in these complexes.

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FAST 2.0/PP/25

Spectroscopic DNA binding studies of some synthesised ruthenium complexes

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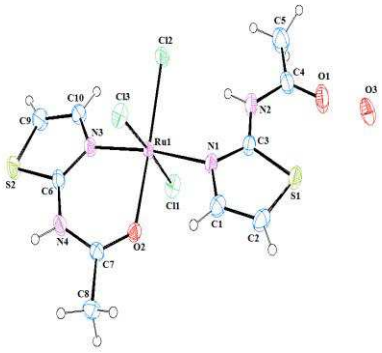
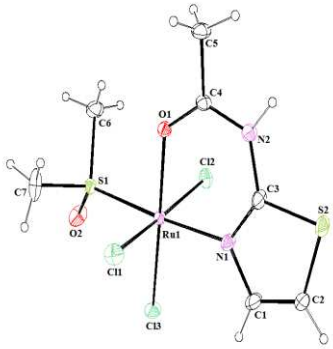
Abstract:

Ruthenium complexes were synthesised using 2-acetamido thiazole and dimethyl sulfoxide ligands. The synthesised complexes were characterised from XRD and other spectroscopic techniques. The molecular structures of the complexes were determined from single crystal X-ray diffraction and other analytical techniques. Binding properties of these complexes with CT-DNA in tris hydrochloric acid buffer at P^H 7.4 were investigated by using UV-Visible, Emission spectral and further electrochemical techniques.The binding constants are in the range of 10^5 M^{-1} showed hypochromism which indicate good binding affinity towards CT-DNA.





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Chitosan derived composites: A versatile and promising biomaterial

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Abstract:

Human civilization has achieved a lot in both development and technology in this 21st century, but we are still lacking behind to find a solution for pollution. The global primary production of plastic wastes is estimated to be approximately 300 million tonnes every year which is expected to rise by 70 percent till 2050 unless we find a solution for it. Even with all those advanced technologies, we can recycle just 9.1 % of plastic wastes from our surroundings and the rests are dumped as wastes. In this context, chitosan, a bio-plastic which can be derived chemically or enzymatically from the exoskeletons of crustaceans such as shrimps, crabs etc. seems to be a promising material and can be an alternative to synthetic polymers. It is biodegradable, biocompatible and non-toxic with exceptional chemical and biological properties that can be used in a variety of industrial and biomedical applications. Chitosan and its composites have been widely investigated to prepare as cost effective and sustainable replacement for conventional polymers in different application areas, especially in biomedical sector. The current study reviews different aspects of chitosan as a candidate material in the perspective of food packaging application.

FAST 2.0/PP/27

Nanosorbent of functionalized activated carbon with magnetic iron oxide nanorods for efficient removal of chromium ions from aqueous solution

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Abstract:

Water contamination due to hazardous heavy metal causes a high risk to the natural ecosystem and human health. In this study, iron oxide/activated chromium (VI) carbon magnetic composite was used as a nanosorbent for decontamination of chromium (VI) from an aqueous solution over a certain range of experimental parameters. Activated carbon was synthesized using an agricultural waste of sugarcane bagasse while iron oxide/activated carbon magnetic composite was prepared by a hydrothermal approach. The composition and structure of nanosorbent was characterized by Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray (EDX) Spectroscopy, Brunauer-Emmett-Teller (BET), X-Ray Diffraction (XRD), and UV-Visible absorption spectroscopy. The adsorption process of chromium (VI) by nanosorbent was investigated and optimized using the batch technique. The maximum adsorption efficiency of 95% was achieved at the optimum conditions of pH = 4, initial chromium (VI) concentration = 10 mg L^{-1}, nanosorbent dose = 2 g L^{-1}, and contact time = 4 h. The equilibrium data of ions adsorption were fitted well with Pseudo-second-order, Elovich, and Intraparticle diffusion model. In addition, excellent magnetic property enabled via the application of iron oxide nanorods significantly improved the separation efficiency and regeneration of spent magnetic adsorbent. The result in the present work provides an insight on promising green nanomaterial for water remediation applications.

Biography: Dr. Monika Joshi is working as Assistant Professor at Amity Institute of Nanotechnology, Amity University Uttar Pradesh, Noida. She did her Ph. D. in 2012 (Nanoscience and Nanotechnology) from Amity University Uttar Pradesh, Noida, India. Her main research focus is the synthesis of different functional nanomaterials for environmental applications. Her recent research developments include Citrulline rich structurally stable zinc oxide nanostructures, silver/reduced graphene oxide nanocomposite, polymer coated superhydrophobic tetrapodal magnetic nanocomposite adsorbent and different eco-friendly multifunctional nanomaterials for water remediation. She has published more than 18 papers in high impact factor journals and 4 book chapters. She is referee for more than 3 international peer-reviewed journals.

Biotransformation of Single Cell Oil of Trichosporon shinodae to Biodiesel: Production and Physico-chemical properties FAME

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Abstract:

Increasing energy demand and exhausting finite resources are driving forces for paradigm shift from using conventional oils to single cell oils. In biodiesel industry, biotransformation of crude glycerol into fatty acid methyl esters (biodiesel) using oleaginous yeast is a viable approach for development of sustainable, eco-friendly and cost-effective process. In the present study, lipids derived from Trichosporon shinodae oleaginous yeast using crude glycerol from biodiesel industry was optimized using response surface methodology. Enzymatic transesterification of single cell oil resulted maximum Fatty acid methyl esters (FAME) yield of 90.03 %(v/v) after optimization of methanol to oil ratio 14.98, solvent to oil ratio 0.270 in 12.52 h at 25.99 ºC with 1.26 % (v/v) initial water content. The fatty acid methyl esters were tested for suitability of fuel properties and found that the iodine value (114.6–116.4 g I_2/100 g), cetane index (47-48), saponification value (204-207 mg/KOH), acid value (0.9-1.1 mg KOH/g) and higher heating value (37-39 MJ/kg) shows that the oleaginous yeast biodiesel has immense potential to be used either as an additive or as a blend to the conventional fuels that ultimately mitigate the greenhouse gas emissions and climate change.

Keywords: Biodiesel, Enzymatic transesterification, Oleaginous yeast, Trichosporon shinodae, Ultrasound assisted lipid extraction.

Bibliography: S. P. Jeevan Kumar is a student of Prof. Rintu Banerjee, who is a Head of Agricultural & Food Engineering Department, Indian Institute of Technology, Kharagpur. His research studies are biodiesel production from oleaginous yeast and seed biotechnology.

FAST 2.0/PP/29

Paper based Green in-situ Carbon Dots for removal of heavy metals

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Abstract:

With the growth of human civilization via industrial activity leading to modernized cities around the globe along with technological and lifestyle benefits, there is also a high cost of depredation of nature. One such high cost of natural depredation is the contamination of water from urban and industrial wastes which contain heavy metals. Such misuse of nature has adversely affected the humankind itself and has deprived millions of people without a basic, pure and safe drinking water. These toxic heavy metals have already been proved to be a major threat to human due to health associated risk. These materials in excess accumulate in the human body via water and change the structure of many bio-chemicals present in our body like DNA, proteins, enzymes etc. Thus, these heavy metals interfere with proper regular functioning of the human body by changing various metabolic processes. Therefore, the need for effort to remove such contaminants from water becomes essential. Efforts from various groups around the world have resulted in various approaches and strategies for removal of these harmful heavy metal contaminants [1, 2]. In this work, a simple and cheap paper based technology has been developed for the removal of heavy metals from aqueous solutions. For removal of heavy metals, one step green synthesis of chitosan carbon dots [3, 4] were generated via in-situ approach directly on paper [5] using thermal assisted process. The functional paper with the embedded chitosan carbon dots were characterized with Scanning Electron Microscopy, FT-IR and Thermo Gravimertic analyzers. The chitosan carbon dots embedded paper was tested against removal of heavy metals such as Cr, Ni and Sn in the concentration range of 10^{-2} to 10^{-3} M. It was observed that with this approach, we were able effectively remove these metals from solution upto 80%-100%. The efficient metal ions adsorption onto the modified paper was also confirmed by change in color of the paper. The mechanistic insight of separation is also discussed in the paper. Such paper based separation system of heavy metals will lead to development of simple, facile and cost-effective product.

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FAST 2.0/PP/30

A comparative study on the antifungal activities of a series of transition metal complexes having a Schiff base ligand

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Abstract:

Schiff base ligands and their metal complexes are very important in medicinal and pharmaceutical fields because of their broad spectrum of biological activities. In the present study, Schiff base complexes of salen ligand (N,N/-disalicylaldenethylenediamine) with a number of transition metals such as iron(III), cobalt(II), nickel(II) and copper(II) were synthesized by using condensation method and were characterized by FTIR and ^{1}H NMR spectroscopy. Antifungal activities of all these complexes were investigated against three fungal species Cladosporium cladosporioides, Pestalotiopsis disseminata and Curvularia sp. using food poisoning method. It is found that among all these metal complexes, [Cu(salen)] has the highest antiungal activity against all the fungi under study.

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FAST 2.0/PP/31

Basic Zirconium Hydroxide Graphene Hydrogel Used for Dual Removal Study of Fluoride and Arsenic (III) from the Aqueous Systems Using Multicomponent Isotherms and Kinetic models

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Abstract:

Over the past decade, the concentration levels of arsenic and fluoride in surface water have increased significantly, which causes serious diseases such as fluorosis and arsenicosis. Herein, we have synthesized a hydrogel of graphene oxide with basic zirconium hydroxide (BZrH@GHG) and effectively used for the removal of fluoride (F^-) and arsenic (As(III)) [1]. The BZrH@GHG has high surface area 821.816 m^2/g, and adsorption capacity for F^- and As(III) was 250 and 125 mg/g, respectively. Thermodynamics study reveals that adsorption is feasible, spontaneous, and endothermic. THE XPS study explains that hydroxyl groups paticipate in the adsorption of fluoride and arsenic by ion–exchange and complexation mechanism, respectively.

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FAST 2.0/PP/32

The Natural Potential of Transition Metals to Activate the Initial Steps of Fischer-Tropsch Catalysis: A DFT Study

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Abstract:

The first and most crucial step of the Fischer-Tropsch reaction is carbon-mono-oxide adsorption on the surface of the catalyst, followed by its dissociation to form long-chain hydrocarbons. The studies done in this work explores the natural potential of the metals towards the CO adsorption and dissociation and provide a reference for further studies to find the best catalyst for the FT reaction. In this work density, functional theory calculations were carried out on pure and bimetallic nanoclusters of size ~1.2 nm consisting of 55 atoms of Ru, Fe, Ni, Co, Pd, and Pt have been explored.

Based on the CO adsorption and dissociation energies, an initial predictor, percentage difference was proposed in our previous work to identify potentials catalyst systems that worked well for a smaller cluster size containing 13 atoms[1]. In the pure 55-atom clusters of Ru, Ni, Pd, and Co, Ru was found to have a maximum value of the percentage difference, hence greater catalytic performance.

In bimetallic systems, only systems showing better excess energy were considered for further studies. Surface energy was seen to be the dominant factor in the binding of metal atoms in a core-shell arrangement. In bimetallic nanoclusters, $Fe_{13}Ru_{42}$ was found to be the best catalyst among all the binary combinations explored.

Biography: Sumegha Godara is a PhD student majoring in Engineering at Louisiana Tech University under Dr. Daniela S Mainardi. She has defended her PhD dissertation and looking forward to receiving the degree by November 2020. She has completed her bachelors and master's in chemical engineering. She has developed expertise on modeling of catalysts for Fischer-Tropsch process during her doctorate studies. She has co-authored two peer-reviewed papers and has presented her research work in several international conferences. Her research interests include simulation and modeling, nanotechnology and clean energy.

FAST 2.0/PP/33

Trigonella Foenum-Graecum L, Nigella Sativa and Trachyspermum Ammi Mixture as Corrosion Inhibitor nn Mild Steel Alloy in Phosphoric Acid Medium

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Abstract:

The inhibitory effect of the mixture of extracts of Trigonella foenum-graecum L, Nigella sativa and Trachyspermum ammi on the corrosion of Mild Steel in 1.5 M Phosphoric acid was tested by weight loss method, Electrochemical studies such as Tafel polarization, AC impedance and scanning electron microscope (SEM) were carried out to evaluate the corrosion performance of mild steel. Inhibition efficiency(IE) preliminary screening was carried out using weight-loss measurements. The calculation using the weight-loss method shows that inhibition efficiency increases with a concentration that indicates a decrease in the rate of corrosion. In order to analyze the inhibitor mechanism, Potentiodynamic polarization and AC impedance studies were used. Polarization studies showed that through a mixed-mode mechanism these inhibitors lowered the corrosion current densities. The EIS data for the electrode/electrolyte interface was analyzed by an equivalent circuit model. Impedance data analysis was carried out for the measurement of the double layer capacitance value using an equivalent circuit with a constant phase angle element. The presence of the adsorbed protective film of green inhibitors was verified by SEM observations. This article provides a distinctive list of natural products that are used as consumption inhibitors for Mild Steel alloys in influential media.

Keywords: Mild Steel; Corrosion inhibitors; Plant extracts; Phosphoric acid; SEM

Biography:

Dr.K.M.Veerabadran presently is an Asst. Professor (Senior grade) and staff in charge of chemistry, MIT campus, Anna university, He has 25 years of Teaching and Research experience. He currently lives in Chennai. He is currently the secretary, National Association of corrosion engineers, NACE International (Houston, USA), NIGIS-SZ and executive committee member, ASM International, Chennai chapter. Currently involved in all corrosion studies of Biomaterials and other industrial components.

FAST 2.0/PP/34

Synthesis of Co-doped biphasic TiO_2 semiconductor for effective solar photocatalytic applications

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Abstract:

Photocatalytic degradation of organic pollutants using metal oxide semiconductors is the most challenging but exigent technique. A number of photoactive metal-oxide semiconductors has been used for the production of hydrogen, CO_2 valorisation, DSCC and water purification. However, the solar to energy conversion efficiency is found to be limited mainly due to inability to absorb full range of solar radiation, high recombination and low surface area of the photocatalysts. In this present work, cobalt (Co) doped TiO_2 nanoparticles were synthesized via the modified sol-gel method and the structural and optical properties were investigated for monophasic and biphasic titania. The Powder X-ray diffraction (PXRD) spectra of pristine TiO_2 and Co-doped TiO_2 confirm the presence of anatase and rutile phase of TiO_2 at higher calcination temperature. The UV-DRS spectrum of pristine TiO_2 shows a sharp absorption at the ultraviolet region corresponding to the bandgap of 3.2 eV. The bandgap of cobalt doped monophasic and biphasic TiO_2 is found to be reduced to 2.7 eV and 2.8 eV, respectively. The morphology of TiO_2 and Co-doped TiO_2 were investigated using scanning electron microscopy (SEM) and transmission electron microscopy (TEM) technique. The particle size is found to be 30 ± 5 nm and 24 ± 6 nm for pristine TiO_2 and Co-doped TiO_2, respectively, which is consistent with PXRD results. The increased absorption of the solar radiation in the higher wavelengths and the reduced charge carrier recombination due to biphasic state of TiO_2, enhances the potentiality of the photocatalyst for sustainable energy applications.

Keywords: Metal-oxide, Semiconductor Photocatalyst, Visible light active

FAST 2.0/PP/35

Nanotwinning in biosynthesized sub-10 nm silver nanoparticles

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Abstract:

Biosynthesis and particle size play pivotal role in tuning the nanomaterials property and their assembly. However, does it impart special structural change to sub-5 nm silver nanoparticles is still under investigation. In the current report, we have synthesized Azadirachta indica leaves methanolic extract mediated silver nanoparticles. We observed nanomaterial self- assembly at microscopic scale (~500 nm). The detailed high resolution transmission electron microscopy (HR-TEM) results revealed nanotwinned silver nanoparticles in 2-5 nm range. Synchrotron X-ray diffraction studies (XRD) shows that synthesized silver nanoparticle exhibits FCC structure which is consistent with HR-TEM results. These physicochemical properties of synthesized silver nanoparticles can be leveraged for biomedical and environmental applications.

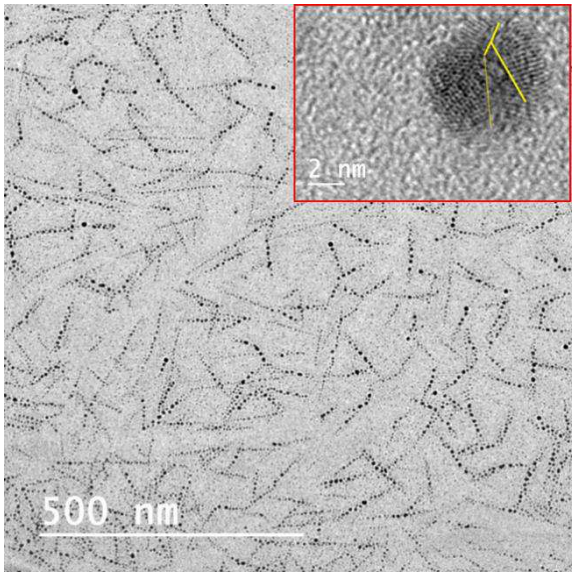

Fig: HR-TEM: Silver Nanoparticles Self-assembly and inset shows Silver Nanotwinning.

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FAST 2.0/PP/36

Heterogenous Catalysis in Aqueous Medium by Copper Oxide Nanoparticle Immobilized on Micro-crystalline Cellulose (Cu_2O@MCC)

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Abstract:

Motivated by the research for new efficient scaffolds e.g. heterogeneous catalyst and heterocyclic molecules, we synthesized Cu_2O nanoparticle Immobilized on Micro-crystalline Cellulose was studied for its catalytic property towards the synthesis of a wide range heterocyclic molecule via the 1,3-dipolar cycloaddition between Isatin, Tetrahydroisoquinoline (THIQ) and styrene isoxazole compounds. Recently, metal oxide nanoparticles with stabilizers have been used recurrently as metal catalysts due to their high stability. Metallic NPs have distinct qualities, particularly their large surface area, which makes them applicable to a wide range of fields. Among the metal oxide NPs, copper oxides (Cu_2O, CuO) nanoparticles are an efficient catalyst for various reactions. To stabilize Cu_2O NPs, microcrystalline cellulose has been used as an immobilizer and has several advantages such as low cost, availability, renewability, lightweight, nanoscale dimension, and unique morphology.

Nanocomposites have been synthesized by a simple co-precipitation method and characterized by scanning electron microscope, energy dispersive X-ray analysis, transmission electron microscope, X-ray diffraction analysis, and thermogravimetric analysis. The salient features of the present protocol are eco-friendly reaction conditions, shorter reaction time, reusability of the catalyst, and a wide range of substrates.

Bibliography: Bhupender Kumar had graduated B.Sc. in Non-Medical from Govt. National College, Sirsa (Affiliated to CDLU) in 2015, and received his Master's degree in Chemistry from Central University of Punjab, Bathinda in 2018. Currently, he is Ph.D. Research Scholar under the supervision of Dr. L. Raju Chowhan in the School of Applied Material Science, Centre of Applied Chemistry, Central University of Gujarat, Gandhinagar. His research interest is the synthesis of the environmentally friendly nanocomposites, heterocyclic molecules, and their applications.

FAST 2.0/PP/37

Silver filled carbon nanotubes: Synthesis, characterization, properties and iodine vapor sensing

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Abstract:

Multiwalled carbon nanotubes (MWCNT) were filled with silver in its core using a simple method which involves stirring of MWCTs in $AgNO_3$ solution at room temperature in open air followed by heating in H_2 atmosphere at 250°C for two hours. Process also leads to small coating of Ag on the surface.

Presence of crystalline silver was confirmed in both coating and filling in hybrid MWCNTs by HTEM, EDX and electron diffraction. Bulk thermal diffusivity and thermal conductivity of Ag hybrid MWCNTs were surged by 242% and 255%, respectively. Current-voltage measurements using tuna probe in atomic force microscopy showed higher number of charge carriers in the Ag hybrid nanotubes compared to pristine MWCNTs which resulted in up to 173% increase in their electrical conductivity.

The Ag hybrid MWCNT based sensor also showed rapid and reversible sensing for I_2 vapors and demonstrated sensing response of 45% in ~60 sec at room temperature. After removal of I_2 vapors source, the recovery took 400 seconds and required heating at 100°C in air. The Ag-MWCNTs film displayed high stability, repeatability and selectivity for I_2 vapors.

Detailed study of process, characterization, sensing and mechanism will be presented in the conference.

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Authors Biograph: Robin Kumar received the M.Sc and M.Tech (Microelectronics & VLSI design) and Ph.D from the Kurukshetra University, India. He is currently working as an Assistant Professor at Amity Institute of Nanotechnology, Amity University, Noida, India since 2007. His research interests are sensors and sensor technology, MEMS, device modelling.

FAST 2.0/PP/38

Rapid detection of toxic metal ions in aqueous environmental matrices

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Abstract:

The detection of hazardous carcinogenic heavy metals in aqueous solution is important for biological health and environmental protection. In this paper, the colorimeter is developed in lab for the detection of hexavalent chromium [Cr (VI)] in the aqueous solution. Moreover, the absorbance principle is used to calibrate and measure the concentration of the known sample using amplified optical power light emitting diodes (OP-LED). The estimation of concentration of Cr (VI) in aqueous solution is evaluated and programmed in a low-cost. The readings displayed on the lab developed instrument annotates that the concentration percentage of the known sample can be used to determine the unknown concentration. The concentration of known solution is determined and compared with commercially available colorimeters with respect to the lab developed colorimeter. The fabricated sensor can be useful in detection of hexavalent chromium which is potential carcinogen from different water sources. The sensor provides potential alternative for expensive, lab based sensors. The designed sensor is portable, easy to handle and can work efficiently on field. The sensor can also be further calibrated for determination of other metal ions as well.

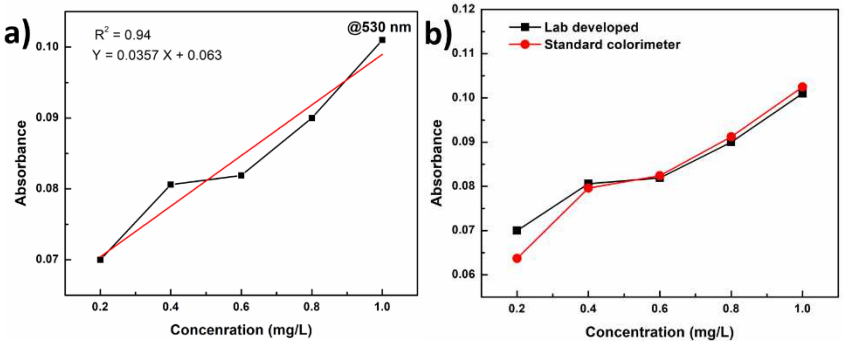

Fig: Comparison of lab developed colorimeter response with standard colorimeter

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FAST 2.0/PP/39

Antimicrobial and antioxidant properties of the chemical constituents from the seeds of Elaeocarpus floribundus Blume

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Abstract:

Elaeocarpus floribundus, belonging to the Elaeocarpaceae family, is used in traditional medicine for the management of different diseases in North East India. The fruits are edible and extensively used for the treatment of diarrheal and dysentery. In this study, we investigate the bioactive constituents of the ethanolic extract of the seeds of E. floribundus. An extensive phytochemical study of the chloroform and ethyl acetate soluble part of the ethanolic extract of the seeds led to the isolation of five phenolic compounds, including, vanillin (**1**), trans-coniferyl aldehyde (**2**), vanillic acid (**3**), gallic acid (**4**) and apigenin 7-O-(3″-O-p-E-coumaroyl)-β-D-glucopyranoside (**5**). This study presents the first report of these compounds from this source. The isolated compounds were characterized based on their NMR and HRMS data and examined for their antimicrobial and antioxidant activities. Compound **4** showed the most activity against B. subtilis with a minimum inhibitory concentration (MIC) value of 30 µg/mL, while the MIC values of the antimicrobial standards range between 10-35 µg/mL. Compound **4**, crude ethanolic extract, and the ethyl acetate fraction were more potent free radical scavenger of DPPH. The results show beneficial effects and utilization of E. floribundus seeds in the treatment of microbial diseases as well as oxidative stress.

Keywords: Elaeocarpus floribundus; seeds; ethanolic extract; antimicrobial; antioxidant activity.

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FAST 2.0/PP/40

Unconventional Enclathration of a Single Guest water molecule to Benzoates in Phenanthroline based Ni(II) and Cu(II) Hosts: Anticancer activities and Theoretical studies

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Abstract:

Clathrate compounds have received remarkable attention in crystal engineering because of their inclusion behaviour [1]; which helps to explore guest-host interactions, molecular recognition, dynamics of guest molecules in the supramolecular hosts [2]. Numerous efforts have been made to exploit non-covalent interactions involving aromatic rings because of their crucial role in supramolecular assemblies, molecular biology and crystal engineering [3]. Anion-π and anti-parallel π-stacking [4] contacts have been reported to provide prominent contributions towards the stability of metal-organic compounds and in the engineering of coordination solids [5,6].

In the present work, two new coordination compounds of Ni(II) and Cu(II) involving 1,10-phenanthroline have been synthesized and characterized. Crystal structure analysis of compounds reveal unusual enclathration of guest 4-NO_2bz in the host Ni(II) supramolecular tetrameric cavity, while an interesting unconventional enclathration of a single guest water molecule is observed in the Cu(II) supramolecular host. We have further theoretically analyze the anti-parallel π-stacking and two different anion–π interactions in the compounds using NCI plot index and MEP analysis. The in vitro antiproliferative activities of the compounds have been explored in DL cancer cell lines considering MTT cell viability and apoptosis assays.

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FAST 2.0/PP/41

Iodine doped graphene based chemiresistive NO_2 gas sensor at room temperature

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Abstract:

A novel reversible resistive gas sensor using iodine doped multilayer graphene was developed using a simple method for detecting nitrogen dioxide (NO_2) gas in air at room temperature. Doped graphene material was developed by mixing multi-layer graphene (MLG) with iodine in chloroform and subsequently >6 hours exposure to UV light. SEM and EDX studies showed slight doping of 1% I_2 in the graphene in Fig. 1.

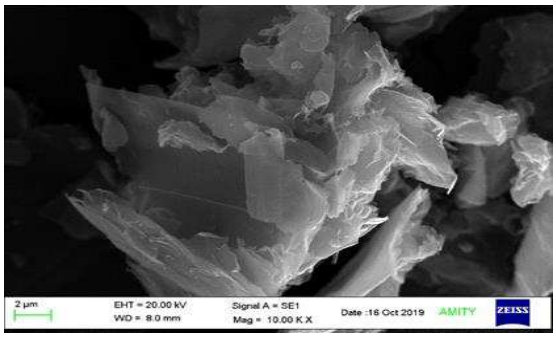

Fig. 1: SEM and EDX of Iodine doped MLG

Element	Weight %	Atomic %
C K	82.95	87.01
O K	16.37	12.89
Cl K	0.16	0.06
I K	0.26	0.03

The sensor film of doped compound was deposited by drop and cast method to study its electrical properties and sensing properties. Sensor showed the response of 160% towards 50 ppm NO_2 gas in 1_2 seconds and recovered to its initial value at room temperature (25℃) with humidity ~30% RH in 1183 seconds. No heating was required either for sensing or recovery. Electrical resistance of sensor film was reduced during the adsorption of CO gas and recovered to initial value after removal of gas source. Iodine doped graphene sensor film showed good repeatability for multiple exposures of NO_2 gas.

In order to decrease recovery time, a field assisting sensor element was fabricated. Field assisting recovery method was employed through gate voltage, which decreased recovery time up to 86% to 160 seconds for 50 ppm NO_2 gas at room temperature.

Biography: Monica Jaiswal received her B.sc degree in physics from Barkatullah University, Bhopal, M.P. and M.Sc degree in physics with material science specialisation from Christ University, Bangalore. Currently pursuing Ph.D on gas sensors under Dr. Jagjiwan Mittal from Amity University, Noida, Uttar Pradesh. Her field of research interest are synthesis of nanoparticles, study of sensing and electrical properties.

FAST 2.0/PP/42

Supramolecular assemblies in Novel Hexanuclear Cu(II) and Polymeric Co(II) Coordination Compounds: Antiproliferative Evaluation and Theoretical Studies

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Abstract:
The ability of the organic bridging ligands to bind with metal ions in different ways makes them suitable candidate for the design and controllable synthesis of polynuclear coordination solids [1-2]. The most dramatic changes in the properties of the molecules occur in the solid state of compounds involving non-covalent interactions which provides organizing force for the association of molecules [3-4]. The formation of supramolecular assemblies is an appealing research topic now-a-days, because of their importance in biology, material chemistry and nano-science [5]. The cooperative action of inter- and intramolecular hydrogen bonding, as well as π–π stacking interactions play increasingly crucial roles in the stability of proteins or nucleic acids [6]. A proper fusion of experimental and theoretical studies is of utmost importance to explore the significance of such supramolecular contacts [7].

We have reported the synthesis and structures of two novel adipato bridged complexes of Cu(II) and Co(II) and characterized them by single crystal X-ray diffraction technique. In addition to the conventional non-covalent contacts, chelate ring···chelate ring (CR···CR), pi–pi stacking and Cu···Cu cuprophilic interactions of significant energy are also observed which are further analyzed theoretically. Nitrate anions and non-coordinated water molecules in Cu(II) compound act as cross-links between the hexameric units by the formation of linear anion-water core via hydrogen bonding interactions. The lattice water molecules linear $(H_2O)_4$ H-bonded chains that are encapsulated in the polymeric network of the Co(II) compound. The antiproliferative potential of the compounds has been investigated considering MTT assay, apoptosis assay, molecular docking and pharmacophore modelling.

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FAST 2.0/PP/43

Quantum Mechanical study on the π-π stacking and Halogen-π interaction in some chloro substituted ethene systems

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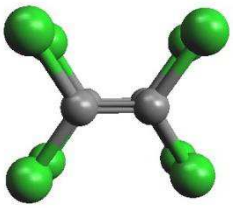
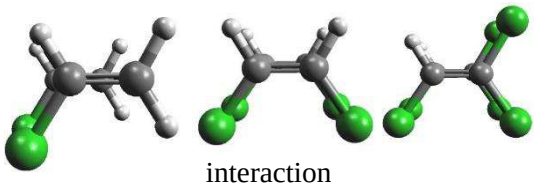
Abstract:

This study emphasizes on the π-π stacking and halogen interaction among chloro substituted ethene systems (monochloroethene, dichloroethene, trichloroethene and tetrachloroethene). Halogen-bonding and hydrogen-bonding have many properties in common, both physical and chemical, for example, the type and kind of halogen-bonding greatly depends on many different factors and substances altogether, producing an effect greater than the sum of the individual effects, also known as cooperative or synergetic effects. The halogens are much larger in size and more polarizable than hydrogen; thus halogen bonding complexes are effectively stabilized by dispersion forces of interactions. The results of MP2 level of theories reflect the extent of dispersion energies accounted in these calculations. Indeed, the electron correlations included in MP2 level with diffused function in the basis set could estimate more negative stacking energies, where the increase of diffuse function in the basis set provides little change in the interaction energy values. The chloro substituted ethane systems were stacked with a vertical separation of 3.0 Å and rotated along different intermolecular rotations/dihedral angles (0˚and 90˚) to obtain the most feasible stable stacked structure. Among the different stacked chloro substituted ethene systems, tetra chloroethene stacked system gives more favoured stacked model, with an interaction energy value of -8.966 kcal/mol; due to the presence of four chlorine atoms which shows strong halogen-π interaction. Even with an intermolecular rotation of 90˚, tetrachloroethene gives the most negative interaction energy value; i.e. it gives most favoured minimized model than that of other stacked chloro substituted ethene systems.





Keywords : π-π stacking, chloro substituted ethene, halogen interaction

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FAST 2.0/PP/44

Facile and rapid non-enzymatic colorimetric nanosensor for the detection of lactic acid in food analysis

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Abstract:

Lactic acid is an α-hydroxy acid, a key organic chemical in biology, food and chemical industries. We are reporting first time, the facile, label-free non-enzymatic colorimetric sensor for detection lactic acid in food sample using nitrophenol (p-NP) added copper nanoparticles (CuNPs). The responses of p-NP (5 mmol/L) to lactic acid in the presence of CuNPs were examined by monitoring the absorption spectra in aqueous solution. The absorption spectrum of p-NP exhibited one intense band at 402 nm (green color) in the presence of CuNPs. Although addition of lactic acid (LA) led to hypsochromic shift (blue shift) with a subtle decrease in the wavelength from 402 to 315 nm, the solution underwent from being colored (greenish-yellow) to colorless. The naked eye nanosensor is ultrasensitive, enabling the visual detection of trace amounts of lactic acid as low as 0.33 mM. The sensor is robust and can work even when challenged with complex sample matrices such as food and pharma samples (wine, cheese, bifilac). With the advantages of simple operation, wash-free and label-free format, visible and intuitive output, and low cost, the naked-eye based colorimetric nanosensor is expected to have potential applications for in-field detection of lactic acid.

Keywords: Lactic acid; p-nitrophenol; copper nanoparticles; food; colorimetric sensor.

Bibliography: Dr. Prayaga Murali Krishna (corresponding author) completed his post-graduation M.Sc. and M.Phil in Physics from Andhra University. He was awarded with Ph.D. in Physics from Andhra University in 2008. He has a long standing UG/PG/PhD teaching experience at different institutes and has also been as research guide. He has attended many international/national seminars, conferences, workshops and has also received various fellowships. Currently, he is working as an Assistant Professor in Physics, Department of Basic and Applied Sciences, National Institute of Food Technology Entrepreneurship & Management (NIFTEM), deemed to be university, under the Ministry of Food Processing Industries, Govt. of India. His research interests are nanocomposite material synthesis and characterisation, biosensors development and green energy technologies.

FAST 2.0/PP/45

Effective utilization of basic nature of WEB in copper catalyzed Chan-Lam N-arylation reaction under ligand free conditions

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Abstract:

The development of green chemical reaction is becoming an attractive task as industry become indefensible without "green Chemistry" approach. Nowadays, green chemistry covers lots of research areas[1] such as design of processes consuming natural feedstock, sustainable resource management and reduction of waste technologies etc. So, researchers are giving continuous effort towards synthetic methodologies using available agro waste extract instead of volatile organic solvent. In this regard, WEB (Water Extract of Banana peel Ash) and related agro waste extract based solvents[2] emerge as alternative reaction medium and it has shown potential as a green solvent for organic synthesis. The basic nature of WEB is an interesting property and in many organic reactions like Dakin[3], Suzuki-Miyaura[4], Sonogashira[5], Henry[6] etc. it has effectively played dual role as reaction medium as well as base.

Here in, we wish to report "WEB" as a reaction medium as well as base for N-arylation of anilines and imidazoles with boronic acid. The mentioned reaction has attracted interest for the frequent occurrence of these fragments in pharmaceutical and agriculture products.[7] The "WEB" was prepared by following a reported procedure. The reaction protocol avoids toxic chemicals, solvents, ligands etc. Addition of alcoholic co-solvent enhanced the yield of the product.

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FAST 2.0/PP/46

Synthesis of pyrimido[4,5-d]pyrimidines using α-C-H functionalization of tertiary amine promoted by I_2/TBHP

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Abstract:
A domino aza-Michael reaction of 6-aminouracils with aldehydes and secondary amines is reported here. Acetic acid catalyzed the reaction by forming a new C=C bond between 6-aminouracil and aldehyde, followed by the attack of an amine. This pathway is well understood from the mass spectral analysis of the reaction mixture. Further intramolecular α-C-H functionalization of tertiary amine leads to the cyclization of the products to pyrimido[4,5-d]-pyrimidines using I_2 (10 mol%) and TBHP (1.5 eq.) in ethanol solvent at room temperature. Finally, a tentative radical mechanism is proposed for the cyclization step based on some controlled experiments.

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FAST 2.0/PP/47

Enhanced Hydrogen Storage Performance of Ball milled rGO/$NaBH_4$ Binary Nanocomposite for Fuel Cell Applications

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Abstract:

In the present work, hydrogen storage performance of reduced graphene oxide (rGO)/sodium borohydride ($NaBH_4$) nanocomposite was studied. A facile ball milling technique was adopted for the synthesis of hydrogen storage material. The structural and morphological studies confirm that the formation of $NaBH_4$ nanoparticles embedded on the surface of rGO sheets. The electrochemical hydrogen storage properties of ball milled rGO/$NaBH_4$ [BrGO/$NaBH_4$] was examined by performing galvanostatic charging and discharging. Where a three-electrode electrolytic cell with 6 M KOH as electrolyte was utilized. A maximum discharge capacity of 1550 mA h g^{-1} was noticed at the 20^{th} cycle, which is equivalent to 5.05 wt% of hydrogen storage capacity for the prepared material. These results show that BrGO/$NaBH_4$ electrode displays superior cycling stability and high reversible capacity. Hence, these excellent characteristics ensure that the prepared BrGO/$NaBH_4$ may serve as efficient hydrogen storage medium and also a potential electrode material for fuel cell applications.

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FAST 2.0/PP/48

Performance of Self-Compacting Concrete with Partial Replacement of ingredients of conventional concrete by Slag

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Abstract:

In the present world concrete is not just a construction material consisting of cement, aggregate, and water, but it is an engineered custom-tailored material with several new constituents to meet the specific needs of construction industry. Slag, a stony waste matter separated from metals during smelting or refining of ore, is one such constituent which can maximize economic and environmental benefit. Several experiments have proved that it can be used as an effective natural aggregate having a long term effect on sustainability. In this research self-compacting concrete (SCC) and conventional concrete specimens with varying proportion of slag aggregates as a replacement of fine aggregates were tested for the compressive strengths. The results show that increase in slag content increases the strength of concrete considerably and however significant results can be obtained by using 50% replacement of fine aggregates by slag.

Key words: Slag, SCC, strength

Bibliography: Mitali Mandal is working as Assistant Professor (Contractual) in the department of civil engineering of Assam Engineering College for the last five years. She is also a research scholar in Assam Engineering College under Gauhati University, Guwahati. Her research interest is in the field of materials, foundation and structural engineering.

FAST 2.0/PP/49

Label-free colorimetric sensor of bentonite/TiO_2 nanocomposite for aflatoxin detection in peanut and corn

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Abstract:

The detection of aflatoxins (AFs) has attracted extensive attention for food safety is a worldwide public health problem. Herein, a novel, simple and label-free colorimetric nanosensor, based on TiO_2 nanoparticles (NPs) incorporated bentonite clay nanocomposite (TiO_2Bt) and natural dye curcumin (Cur) reaction mixture (RM) in the ratio of 0.25:0.1, has been constructed to detect AFs. In the presence of Cur, TiO_2Bt nanocomposite effectively bind AFs due to inner transition of π to π* electrons and advanced oxidation of dye. This is due to the layered structure of TiO_2Bt-Cur which etched into smaller nanostructure in AFs presence. DLS showed lesser agglomeration of TiO_2Bt with increase AFs, due to shift in pH from 10.5 (0.1 ppb AFs) to 7 (20 ppb AFs), and a visible bathochromic shift to dye Cur. Due to improved stability of TiO_2Bt nanocomposite than bare TiO_2 NPs (confirmed with XRD, SEM, FTIR, UV-VIS and zeta potential), TiO_2Bt nanocomposite gave better sensitivity than bare TiO_2 NPs. AFB_1 concentration plotted with SPR band at 413 nm showed LOD of 2.5 ppb in peanut and 0.36 ppb in corn. The recoveries of AFs from spiked corn and peanut exhibited linear trends that correlated well with standard HPLC and LC/MS-MS analytical technique.

Keywords: Aflatoxin; curcumin; TiO_2 nanoparticles; bentonite; colorimetric sensor

Bibliography: Dr. Prayaga Murali Krishna (corresponding author) completed his post-graduation M.Sc. and M.Phil in Physics from Andhra University. He was awarded with Ph.D. in Physics from Andhra University in 2008. He has a long standing UG/PG/PhD teaching experience at different institutes and has also been as research guide. He has attended many international/national seminars, conferences, workshops and has also received various fellowships. Currently, he is working as an Assistant Professor in Physics, Department of Basic and Applied Sciences, National Institute of Food Technology Entrepreneurship & Management (NIFTEM), deemed to be university, under the Ministry of Food Processing Industries, Govt. of India. His research interests are nanocomposite material synthesis and characterisation, biosensors development and green energy technologies.

FAST 2.0/PP/50

Synthesis and investigation of structural and magnetic properties of Sm- modified Fe-based perovskite in the environment of $BaTiO_3$

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Abstract:

The Sm-modified Fe-based new perovskite material $(Sm_{(1-x)}Bi_xFeO_3)_{0.5}(BaTiO_3)_{0.5}$ was synthesized by conventional ceramic route technique. The preliminary structural investigation by X-ray diffraction (XRD) method verified the formation of new material in single phase. The structure of the material was found to varying with different concentration of doping. For x = 0, the material was found to possess monoclinic structure while for x = 0.25 & x = 0.5, it changes to tetragonal and orthorhombic respectively. Rietveld refinement technique was also incorporate for detailed investigation of structure and atomic position of the elements present in the investigated sample. The magnetic investigation carried out through vibrating sample magnetometer (VSM) at room temperature reveals the ferromagnetism in the material for all concentration of doping.

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FAST 2.0/PP/51

Process of Harvesting Electrical Energy from Living Plants

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Abstract:

Generation of electricity from coal, natural gas and other fossil fuel are nonrenewable and harmful to the environment. This leads to develop one alternate process to generate electricity which is renewable and ecofriendly. This paper focuses a method to harvest electrical energy from living plants. The energy is harvested by embedding electrodes into the plant to allow flow of ions and hence generate electricity. The overall purpose of this research is to produce electricity using more sustainable sources. The plant used for this research is aloe vera and the electrodes are copper and iron. Multiple random tests have been performed to determine the characteristics of the harvesting system.

Key Words : Renewable energy , energy harvesting system and living plants

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FAST 2.0/PP/52

Silver Catalysed Hydroacylation Reaction between Aldehydes and Diisopropylazodicarboxylate (DIAD)

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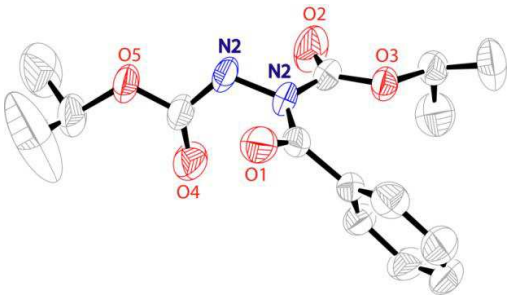
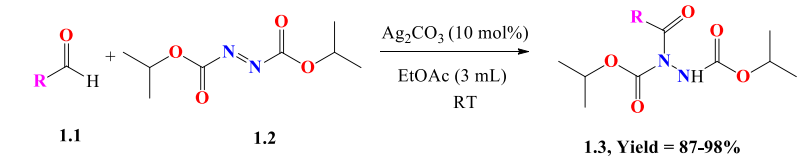
Abstract:

Activation of C–H bonds is an area of immense interest. The Hydroacylation product[1] of Diisopropyl azodicarboxylate and aldehyde containing acyl hydrazide moiety can serve as an excellent synthetic precursor as it possesses a number of interesting chemical properties in it such as acidic proton, relatively weak N–N bond, acyl group, carbamate functionality etc. They can be valuably transformed into more desirable chemical functionalities by reacting with some other molecules.[1a]

In continuation on our effort to achieve C-H functionalization under optimum condition, we have developed an efficient synthetic route which involves reaction between aldehydes, **1.1** and diisopropylazodicarboxylate (DIAD), 1.**2** catalyzed by silver carbonate to give the corresponding hydroacylation products **1.3a-f** in excellent yields, (**Scheme 1**) which are characterized by NMR and Mass Spectroscopic techniques. We have also been able to determine the structure of Diisopropyl 1-benzoylhydrazine-1,2-dicarboxylate, **1.3a (Fig 1)** by X-ray diffraction technique. All the reactions were carried out at room temperature.





R: Ph (**1.1a**); 4-ClPh (**1.1b**), 4-BrPh (**1.1c**), 4-MePh (**1.1d**), 2-FPh(**1.1e**), 3-ClPh (**1.1f**).

R: Ph (**1.3a**); 4-ClPh (**1.3b**), 4-BrPh (**1.3c**), 4-MePh (**1.3d**), 2-FPh(**1.3e**), 3-ClPh (**1.3f**).

Scheme 1: Formation of Diisopropyl-benzoylhydrazine-1,2-dicarboxylate from aldehyde and DIAD

Figure 1

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FAST 2.0/PP/53

Designing of peanut shell extracted activated carbon supported Mg doped g-C_3N_4 nanocomposite for wastewater treatment

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Abstract:

Waste extracted activated carbon supported Mg-doped g-C_3N_4 nanocomposites have been developed for the industrial wastewater treatment. First, activated carbon was isolated from the waste peanut shell by simple chemical process. In next step, the nanocomposites have been synthesized by the coupling of Mg doped g-C_3N_4 with high surface area activated carbon. Mg doped g-C_3N_4 was synthesized by polycondensation method and chosen as photocatalyst because of its high photocatalytic activity in visible region. Different weight ratios of activated carbon (1:1, 1:2, 2:1) with Mg doped g-C_3N_4 were applied to find the optimal point where the maximum photodegradation of effluents achieved. The structural, morphological and catalytical studies were carried out by PXRD, FT-IR, UV-Vis, SEM and HR-TEM microscopy. These photocatalysts will be able to solve the issues related to industrial wastewater treatment and municipal wastes.

Keywords: waste extraction, visible light photocatalysis, electron-hole pair

Bibliography: I, Nupur Sinha, completed my M.Sc. from School of Nano Sciences at Central University of Gujarat, Gandhinagar. My area of interest is designing of waste extracted carbon-based nanocomposites for adsorption and wastewater treatment application.

FAST 2.0/PP/54

Synthesis, Characterization and Electrochemical study of Ru(II) complexes of a polyfunctional dihydrazone

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Abstract:

Schiff bases are significantly versatile in nature. The polar nitrogen atom in azomethine and amido moieties are found to cause chemical, electrochemical and bioactivity in these molecules and also exhibit useful interactions with other macromolecules and metal ions. Ruthenium Chemistry is wide and versatile. A significant body of research has attempted the design of new ligand and their corresponding ruthenium complexes. In this work, the ligand disalicylaldehyde adipoyldihydrazone (LH_4) was synthesized in simple green procedure in two steps. Further, the Ru(II) complexes of the ligand were synthesized and characterized by various physico-chemical and spectral techniques. The stoichiometry of the complexes has been judged mainly from the elemental analysis and thermoanalytical data. The structure of the complexes has been discussed in the light of conductivity, magnetic moment, electronic, IR and ^{1}H NMR spectral studies. Electron transfer properties of the monometallic ruthenium complexes have been studied using cyclic voltammetric technique.

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FAST 2.0/PP/55

Electron transport and recombination in natural-DSSCs studied using impedance spectroscopy

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Abstract:

Electrochemical Impedance Spectroscopy (EIS) is a major tool for investigating the properties and mechanism occurring in Dye Sensitized Solar Cells (DSSCs). EIS study was done through the measurement of cell impedance over a range of temperature and frequency and their analysis. In this work the transport properties of DSSCs fabricated using natural dyes (Melastoma malabathricum (MM) and Punica granatum L. (PGL)) as sensitizer were studied and co-related with its efficiency. DSSCs at different external conditions (dark, external bias and under light illumination) were studied. A mathematical approach was used to interpret the frequency response in terms of the fundamental electronic and ionic processes. An infinite transmission line was used as an equivalent circuit for modeling. The transport resistance (R_t), recombination resistance (R_r), chemical capacitance (C_μ), diffusion co-efficient (D_n), diffusion length (L_n), electron lifetime (τ_n) of electrons in the mesoscopic film were evaluated from impedance data. The transport properties were correlated with efficiency of DSSCs obtained. It was found that the value of R_r and τ_n decreased under light illumination for all cells. However, electrons in DSSC sensitized with MM dye had higher lifetime compared to cells sensitized by PGL dye leading to its higher efficiency.

Keywords: Electrochemical Impedance Spectroscopy, DSSCs, transmission line model, sensitizer, efficiency

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FAST 2.0/PP/56

Synthesis of doped Carbon Spheres

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Abstract:

Carbon Spheres have concentric graphitic layers, made from paring of pentagonal and hexagonal rings. It has open dangling bonds, instead of closed shell they have bunch of wavy flakes which give them curvature of sphere thus creating open edges for further reactions. It can be synthesized using carbon sources like glucose, sucrose and various hydrocarbons. In present study we synthesized Carbon spheres using freshly prepared Jaggery. Obtained Carbon spheres were etched using NaOH and filled by $SnCl_2$. SEM images in fig.1 shows successful synthesis and filling of carbon spheres.

Due to their high available active surface area, thermal stability, electronic properties and low density carbon spheres find their application in charge storage and transfer like lithium batteries, catalysis and supercapacitor, the surface and structure of carbon spheres make them available for adsorption purpose. Their potential application in sensing and supercapacitor are being researched.

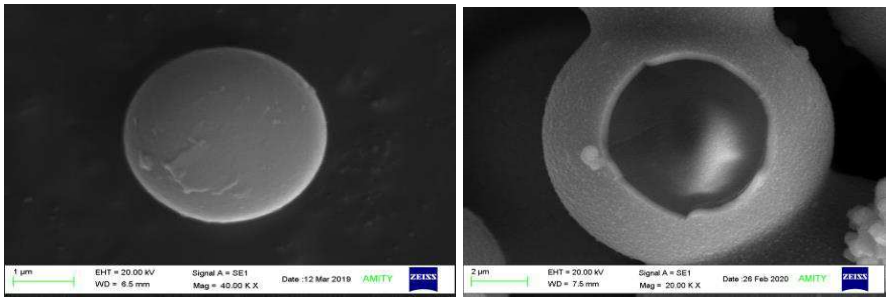

Fig.1 SEM images of carbon spheres

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FAST 2.0/PP/57

Endophytic Fungus Assisted Green Fabrication of Nitrogen-doped Co_3O_4 Nanoparticles; their Characterization and Solar Photocatalytic Activity

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Abstract:

The modified spinel Co_3O_4 semiconductor nanoparticles come to limelight for exhibiting the enhanced activity in the fields of technology, bio-science and catalysis[1–3]. In this study, Nitrogen-doped Co_3O_4 nanoparticles (N-Co_3O_4 NPs) were fabricated by using a facile bio-inspired top down approach based on endophytic fungus Fusarium oxysporum and their photocatalytic activity was investigated by the degradation of methylene blue (MB) dye in the presence and absence of sunlight. The shape, size and crystallinity of N-Co_3O_4 NPs were confirmed by TEM, HRTEM and XRD whereas FTIR and cyclic voltammetry (CV) were performed for the conformation of nitrogen doping[4,5]. The biosynthesized N-Co_3O_4 NPs with average size 20-30 nm exhibit good photocatalytic activity and degraded 87% MB within 120 min under sunlight irradiation at temperature 32±1 °C. The photo-oxidation, absorbance and band gap of N-Co_3O_4 NPs were determined by the UV-Vis-NIR spectrophotometry. Thermal properties and enthalpy changes were also investigated by performing Thermogravimetric Analysis and Differential Scanning Calorimetry (TGA/DSC) in nitrogen atmosphere and it was observed that the decomposition of synthesized nanoparticles started from 700 ^{0}C.

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FAST 2.0/PP/58

Hydrogen evolution with low cost electrochemical water splitting using nanoporous Fe based composite electrode

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Abstract:

Artificial photosynthesis through solar driven water electrolysis is a green, sustainable method for H_2 production due to zero emission of greenhouse gases. Development of stable, economically viable and efficient electrode material for hydrogen evolution is a challenging and demanding task facing by researchers around the globe. In this paper, we present a low cost Fe based metal alloy as electrode material for water splitting due to its easy availability and long durability even in high pH environments. The high electrochemical surface area of the nanoporous structured electrode material was characterized by TEM images. The electrochemical performances were studied by CV, LSV and Tafel plots. Along with a good HER catalyst, we have achieved the commercially viable current densities of 861 mA cm^{-2} at 1.5 V, with excellent stability and at a dramatically lower voltage than previously reported papers. The characterization of nanostructure combined with the evaluation of electrochemical performances proves that Fe electrode surface composition is of hierarchical porous morphology with high surface area and low over potential. Therefore, it is the most promising approach for efficient production of Hydrogen by water splitting for industrial purposes and to fulfill energy crisis in the near future.

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FAST 2.0/PP/59

Physicochemical and Antimicrobial Study of Phytoconstituents loaded zein based nanoformulations

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Abstract:

Plant diseases caused by phytopathogenic microorganisms involved a series of biological activities and complex processes between the microorganisms and the surface of a plant which can be reduced by intervention of nanotechnology leading less ecotoxicity. In our work, limonene and rotenone (plant derived active ingredients) loaded (RNZD and LNZD) formulations showed significant antimicrobial activity against phytopathogens- P. syringae and F. oxysporum compared to free active ingredient alone. The encapsulation efficiency of 95.28 % ± 0.029 and loading efficiency of 8.66 % ± 0.003 was calculated for RNZD through HPLC while encapsulation efficiency of 82.09 % ± 0.034 and loading efficiency 23.45 % ± 0.009 were found for LNZD through GC studies. FE-SEM micrograph showed self-assembled ZD, RNZD, and LNZD NPs having spherical structures with an average size of 394, 357, and 267 nm respectively and also further characterized through FTIR, ^{1}HNMR, and DSC studies. The MIC value of RNZD and LNZD is 12 and 64 µg/ml against P. syringae and F. oxysporum is 36 and 192 µg/ml respectively. Such synergistic attribution of the prepared nanoformulations could become a sustainable system that can be suitably used for efficient control of certain plant diseases caused by the studied phytopathogens.

Keywords Rotenone; Limonene, Antimicrobial activity, Phytopathogens

Biography: Dr. Umesh Kumar is an interdisciplinary person with a Ph.D. in Biotechnology from CSIR-National Chemical Laboratory, Pune, India followed by Postdoc from Georgia Institute of Technology, USA. Presently he is working as Assistant Professor in School of Nano Sciences, Central University of Gujarat, Gandhinagar. His research at Central University of Gujarat is directed towards development of biodegradable nanocarriers for delivering small molecules both for agricultural (Botanicals) and drug delivery (nutraceuticals) purposes.

FAST 2.0/PP/60

Instant oxidase-mimic of Ce-substituted WSe_2 nanostructures for colorimetric detection of Benfuracarb Insecticide

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Abstract:

Benfuracarb, a carbamate insecticide, is known as a toxic chemical for our environment and widely used in agricultural fields. These types of insecticides are sequestrated by the vegetable and fruit plants and can affect the living being. Therefore, an easy, stable and low-cost method for sensitive and selective detection of Benfuracarb is significantly required. For this purpose, Ce-substituted WSe_2 nanostructures have been prepared first time using simple hydrothermal method. The prepared nanostructures have been validated using PXRD, FT-IR, UV/Vis., FESEM, EDX and HR-TEM analytical techniques. As prepared nanostructures showed excellent oxidase-mimicking activity for the colorimetric detection of Benfuracarb. The limit of detection (LOD) was found to be ~1.13 □g/ml with the linear range of 5 - 10 □g/ml. The selectivity of Benfuracarb against the interferences like Aldrin, Carbofuran, Dieldrin, Endosulfan and Fenson has also been investigated. This efficient and low-cost biosensor could be useful for the detection of pesticides and insecticides in real samples also.

Keywords: Oxidase-mimicking, Benfuracarb, colorimetric detection, limit of detection

FAST 2.0/PP/61

A sequential oxidative annulation and N-demethylation strategy: Synthesis and photophysical properties of pyrrolo[3,4-c]quinoline-1,3-diones

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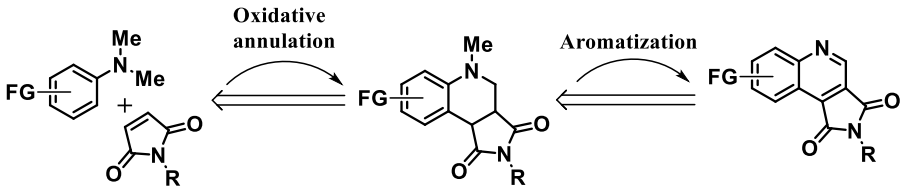
Abstract:

The quinoline and pyrrolidine ring systems are unique structural motif found in many natural products and bioactive compounds.[1] They are extensively used in numerous commercial products, such as fragrances and dyes.[2a] Fusion of these privileged heterocycles are a promising class of pharmaceutical scaffold with anticancer, anti-tuberculosis, antifungal, anti-inflammatory, anti-hypertension, anti-HIV and anti-Alzheimer's activity.[2b] Due to their wide applications in pharmaceuticals, construction of this fused heterocycle has a special significance to organic chemists, as well as to pharmaceutical chemists. In this regard, several synthetic methods have been made for the synthesis of pyrrolo-fused-quinolines. Among them pyrrolo[3,4-c]quinolines are rarely reported analogues. Although, most of the reported methods are limited by their complication, harsh reaction condition, multiple steps and low yield.[3] Therefore, we reported an efficient disconnection strategy for the synthesis of pyrrolo[3,4-c]quinoline-1,3-diones. This synthetic protocol consists of a sequential CeO_2-catalyzed oxidative annulation followed by DDQ-mediated dehydrogenation and N-demethylation reaction starting from N,N-dimethylaniline and maleimide. Developed synthetic method provides a series of tetrahydroquinolines and pyrrolo[3,4-c]quinoline-1,3-diones in good yields with excellent functional group compatibility. In addition to that, we have studied the photophysical properties of our synthesized pyrrolo[3,4-c]quinoline-1,3-diones and some of them showed good fluorescent quantum yield up to 76%.



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FAST 2.0/PP/62

Unconventional nitrile based Supramolecular assemblies in Ni(II) and Zn(II) Coordination Compounds: Antiproliferative Evaluation and Theoretical Studies

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Abstract:

The construction of metal-organic supramolecular architectures depends on various synthetic factors such as the nature of the metal centers [1], counter ions [2] and the reaction conditions [3]. Selection of suitable organic moieties also plays a significant role for assembling architectures of desired dimensionalities [4]. Transition metal complexes of pyridine dicarboxylates and pyrazole-based ligands have been extensively used in recent times to exploit the supramolecular assemblies in coordination compounds [5]. In addition to the conventional non-covalent interactions, unconventional contacts involving nitrile moiety are of particular interest engineering coordination solids [6].

Herein, we have synthesised and characterized two new coordination complexes viz., [Ni(2,6-PDC)(Hdmpz)(H_2O)$_2$]·H_2O (**1**) and [Zn(3-CNpy)$_2$Cl$_2$] (**2**) (2,6-PDC = 2,6-pyridinedicarboxylate, Hdmpz = 3,5-dimethylpyrazole, 3-CNpy = 3-cyanopyridine). Crystal structure analysis of compounds **1** and **2** reveals the presence of anion–pi, energetically significant CN···CN and unconventional C–H···pi(nitrile) interactions in the supramolecular assemblies. We have further theoretically explored these interactions using DFT calculations, MEP and QTAIM analysis. The in vitro antiproliferative activities of the compounds have been explored in DL cancer cell lines considering cytotoxicity, apoptosis, molecular docking and pharmacophore features.

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FAST 2.0/PP/63

Chitosan/Zeolite hybrid membranes for the separation of nitrogen, n-hexane and 1-butene mixed gases released from CX slurry process

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Abstract:

Production of polyethylene (PE), high density polyethylene (HDPE) involve CX slurry process. At the end of production process, a mixture of nitrogen, n-hexane and 1-butene is produced from the gas drying process. The separation of these mixed gases using membrane based separation system is employed in the present research to add on to cost effectiveness of HDPE production. This membrane separation system gave an ideal purity with an aid of chitosan membrane anchored with a 4A zeolite particles. The performances were studied by varying zeolites weight, thickens of membranes, using different substrates (polypropylene and polyester) along with effect of cross linkers. All experimentations were performed with an aid of self-constructed operating unit (connected to GC) as in figure 1. The overall evaluation revealed the Knudsen diffusion model for the separation mechanism. The results showed that, non-cross-linked composite membrane with 100-micron thickness and polypropylene spunbond non-woven base and with 1 % zeolite 4A loading shown a better result with a separation factor of 2.08±0.06 for nitrogen/hexane pair and 1.28±0.10 for nitrogen/1-butene with a total gas permeability of 5127±745 barrels at an operating temperature of 10 ^{o}C, 4 bar inlet membrane pressure and 1 bar permeate pressure.

Key words: Gas separation; hybrid membranes; zeolites; CX slurry process

Figure 1: Gas separation testing unit

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FAST 2.0/PP/64

Structural, Optical Properties of Copper Oxide Nanoparticles using Citrus Maxima Peel Extract

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Abstract:

Discarded fruit peels create serious environmental pollutions inviting practical challenge to the sustainability. The recycle of such waste agriculture product limits the pollution and sustains the environmental balance. This paper reports the synthesis of copper oxide nanoparticles using aqueous extract of citrus maxima peel and copper nitrate as precursor. Structural analysis by X-ray diffraction (XRD), Energy dispersive spectroscopy (EDS) and Fourier transforms infrared spectroscopy (FTIR) investigation revealed pure phase formation of CuO with monoclinic crystal structure. UV-visible diffuse reflectance spectroscopy was used to estimate the band gap energy of CuO nanoparticles. Scanning electron microscopy (SEM) revealed the spherical morphology of CuO nanoparticles. Photoluminescence (PL) was carried out to investigate materials imperfection and recombination mechanism. The details of the work will be discussed during the presentation.

Biography: Mr. Sanjib Kumar Baglari is currently working as an Assistant Professor in the department of Physics at Birjhora Mahavidyalaya, Bongaigaon, Assam. He is pursuing his PhD degree from department of Physics, CIT (Deemed to be University, MHRD, Govt. of India), Kokrajhar, Assam. His research interest are in the field of material science like Biomaterials, Nanomaterials, Conducting Polymers etc.

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FAST 2.0/PP/65

Morphological evolution of Mn doped ZnO with improved visible light assisted photocatalytic performance

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Abstract:

Optical response and morphology of the material plays a vital role in the photocatalytic performance, even so it is difficult to tune both the factors simultaneously. ZnO is a wide bandgap semiconductor having the ability to exhibit different forms of morphologies. Therefore, the current work demonstrates the template-free synthesis of Mn-doped ZnO with the improved optical response and a variety of nanostructures. The photocatalytic performance of the samples was examined towards the degradation of methylene blue under solar and visible light irradiation. Among all the samples, ZnO with rice grain-like structure showed superior photocatalytic performance under solar and visible light illumination. In addition, the influence of optimal Mn contents on the structural, surface, and optical properties were also investigated systematically. The results clearly indicate that the incorporation of Mn with optimal content not only assists the morphological evolution but also improves the optical response of ZnO towards the visible region. The photocatalytic tests revealed that the 1.0wt. % Mn-doped ZnO exhibits superior performance both under solar and visible light irradiation. This improvement can be attributed to the synergetic effect of Mn and ZnO, which leads to the increased lifetime of the photo generated charge carriers, the formation of suitable defect states, elevated photon absorption, and availability of sufficient exposed sites on the surface of the photocatalyst.

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FAST 2.0/PP/66

Peroxidase-mimicking activity of Ce-substituted $MoSe_2$ nanostructures for colorimetric detection of glucose and hydrogen peroxide

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Abstract:

Nanomaterials-assisted enzyme mimicking with superior catalytic activity is an effective way to resolve the challenges for replacement of natural enzymes. High robustness and reproducibility of nanozymes make them the potential candidates for replacing the natural enzymes. Here, a simple one-pot hydrothermal method is applied for the synthesis of Ce-substituted $MoSe_2$ 2-D nanostructures. The as synthesized nanostructures have been characterized by PXRD, FT-IR, UV/Vis., FE-SEM, EDAX and HR-TEM microscopy. Ce-substituted $MoSe_2$ was found to be an excellent intrinsic peroxidase-mimicking nanozyme that oxidise to 3, 3',5, 5'-tetramethylbenzidine (TMB) in the presence of H_2O_2. The enzyme kinetics of Ce-substituted $MoSe_2$ catalyst follows the Michaelis – Menten reaction model. This metal-free catalyst has been synthesized first-time for the colorimetric detection of H_2O_2 and glucose with high sensitivity. Limit of detection (LOD) and linearity range for glucose was obtained ~1.698 µM and 10 - 50 µM respectively.The selective and sensitive detection of glucose makes this catalyst an appropriate biosensor in the applications of food, pharmaceuticals and clinical diagnosis.

Keywords: Nanozymes, biosensor, enzyme catalyst, glucose sensing

Bibliography: I, Gajendar Singh, am working on Ph.D. research work in Nano Sciences under the supervision of Dr. Manu Sharma, Assistant Prof., School of Nano Sciences, Central University of Gujarat. Our work focuses on the synthesis of Mo based new nanocomposites for energy and sensing applications.

FAST 2.0/PP/67

1st Principle calculation on monolayer and bilayer Phosphorene

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Abstract:

Phosphorene is a two dimensional material of Phosphorous. It is basically a single layer of phosphorous that has been mechanically exfoliated recently. It holds some great promises for applications in FETs, thermoelectric devices, Li ion battery anode, photocatalyst, solar cell applications etc. Our present study involves first principle calculations on monolayer and bilayer of phosphorene using QUANTUM ESPRESSO. It has a tunable band gap which leads to many applications in different devices. Phosphorene, a single layer of black phosphorus, has attracted considerable attention recently due to its intriguing structures and fascinating electronic properties. In particular, its remarkable properties, such as high charge carrier mobility, direct band-gap semiconducting characteristics, and strong anisotropies in electro-optical and thermomechanical properties, etc. are opening up brand-new opportunities for its applications in nanoelectronics, optoelectronics, sensors, energy conversion, and advanced engineering materials, etc. It is expected that this fascinating material will continue to offer tremendous opportunities for research and development for the foreseeable future.

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FAST 2.0/PP/68

2D/2D nanosheets of nitrogen doped g-C_3N_4/In_2S_3 for enhanced photocatalytic degradation of MB dye and industrial sewage effluents

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Abstract:

The day-by-day increased water contamination by industries has resulted serious problem to the human population around the world. Moreover, waste generated by the textile industry and biogas bolting plant are creating severe destruction by contaminating air and water to the environment. To control water pollution, many physical and chemical methods have been applied to degrade organic and industrial wastewater. Photocatalysis is one of the effective techniques that can degrade the pollutants by easy and cost-effective method. Here, we have developed 2D/2D nitrogen doped g-C_3N_4/In_2S_3 nanocomposites [Ngcn/InS], which exhibit high surface area and visible light photocatalysis with improved photocatalytic activity by varying the weight ratios of Ngcn/InS [(1:1), (1:2), (2:1)]. Ngcn/InS [1:1] showed the maximum photocatalytic activity ~98% in 10 min by degrading MB dye under the visible light source (Tungsten bulb, 200W). It presented the maximum photodegradation rate of 0.115 min^{-1} which is ~2 and 8-fold times than pristine In_2S_3 and Ngcn, respectively. Moreover, Ngcn/InS [1:1] showed a good adsorption capacity of 5.02 mg/g which is 2-fold times than pristine Ngcn. The enhanced adsorption capacity and photocatalytic degradation of Ngcn/InS [1:1] could be attributed to high rate of electron-hole pair separation and wide range of visible light region.

Keywords: Nanocomposites, visible light photocatalysis, electron-hole pair

Bibliography: I, Vuggili Sai Bhargava, is pursuing Ph.D., in School of Nano Sciences at Central University of Gujarat, Gandhinagar. My area of interest is synthesis of carbon-based nanomaterials and metal sulphides with controlled morphology for the application of visible light sensitive photocatalytic degradation of dyes and industrial wastewater treatment.

FAST 2.0/PP/69

Metagenomic analysis of wilt-infected rhizospheric soil samples reveals abundance of Micrococcus luteus in Punica granatum L.-First Report

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Abstract:

Wilt disease affecting pomegranate crops result in rapid soil-nutrient depletion, reduced or complete loss in yield and crop destruction in India. Although, there is evidence of association of certain fungi and nematodes that cause this disease, there are limited studies and information on diversity of microbial community using genomics studies. In the present study, rhizospheric soil samples from pomegranate plants ranging from healthy to severely disease infected ones in an orchard situated in Karnataka, Southern part of India. Physical examination of the plants revealed the presence of root knot in the wilt infected plants. 16S metagenomics sequencing was performed using Oxford MinION Nanopore platform, followed by assessment of bacterial diversity and functional pathway analysis. The total bacterial counts and total fungal counts showed no significant differences. Physicochemical comparison showed significant decrease in pH levels of the infected plant soil (6.49) as compared to the healthy plant (7.66) in contrast to significant increase in Cl (19.5 ppm), Cu (30.4 ppm), Zn (32.05 ppm) and B levels (4.2 ppm) in the infected plant's soil samples. Interestingly, 16S rRNA sequencing data analysis revealed Micrococcus luteus as most abundant in the infected sample alone, followed by Luteitalea pratensis, Cutibacterium acnes, Sphingomonas panacis, and Rhodobacter sphaeroides. The present study demonstrates the capabilities of the 16S rRNA sequencing of soil samples for identifying potential key players for diseases such as the wilt disease wherein the symptomatology is complex. We report for the first time Micrococcus luteus in wilt infected soil samples of Pomegranate.

Key words- Pomegranate; 16S rRNA sequencing; Punica granatum; Micrococcus luteus; Wilt disease

FAST 2.0/PP/70

Synthesis and Characterization of Novel Transition Metal Complexes of Schiff Base (E)-2-((7h-Purin-6-Ylimino) Methyl) Phenol and Their Study on Antibacterial Activity and Magnetic Susceptibility

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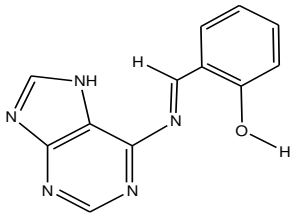
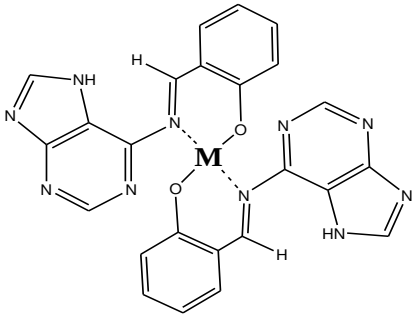
Abstract:
Novel transition metal complexes were synthesized by refluxing ethanolic solutions of Manganese Acetate, Cobaltous acetate, Nickel Acetate, Copper Acetate and Zinc Acetate with Schiff base derived from Adenine and salicylaldehyde in 2:1 ratio. The characterization of Novel transition metal complexes of Mn (II), Co (II), Ni (II),Cu (II), Zn (II) and Schiff Base (E)-2-((7H-purin-6-ylimino) methyl) phenol were elucidated by using ^{1}H NMR, FT-IR, UV, & X-Ray spectroscopic techniques. The synthesized compounds were also been interacted with gram positive and gram negative bacteria and found better activity against various bacteria. The study of magnetic susceptibility of compounds reviled the square planner geometry of copper complex. However, other metal complexes were showed tetrahedral geometry and octahedral geometry respectively.

Key-words: Schiff Base derived from Adenine and salicylaldehyde; transition Metal ion complexes; Antibacterial Activity; Magnetic Susceptibility.



(E)-2-((7H-purin-6-ylimino)methyl)phenol



Bis (Di aqua (E)-2-((7H-purin-6-ylimino)methyl)phenol) Metal (II)

M = Mn^{++},Co^{++},Ni^{++},Cu^{++},Zn^{++}

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FAST 2.0/PP/71

Functional Groups Assisted-PET-Mediated Highly Fluorescent Metal-Organic Frameworks (MOFs) Composite for Detection of Toxic Metal Ions in Water

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Abstract:

Mercury(II) contaminated water has diverse harmful effect on individuals as well as aquatic living creatures. Now-a-days, Mercury(II) detection in water has become a major concern for the scientists in ongoing research. Metal-organic frameworks (MOFs) are considered as an effective device for sensing of toxic heavy metal ions in water. MOFs large surface area with tunable functionalities and high stability with distinct pore sizes enhance its applicability towards fluorescence sensing. Graphitic carbon nitride quantum dots (g-CNQDs) play an important role in the composite material due to its excellent electron transport abilities in exposure to light. g-CNQDs are incorporated into the porous MOFs that enhances its activity for Hg^{2+} detection in water. The fluorescence sensing activity by sensor in distilled water was monitored by varying the concentration of Mercury(II) from 0.001-0.019 µM. The Hg^{2+} sensing activity results in turn-off fluorescence quenching of sensor luminescent intensities. The LOD and Stern-Volmer constant (Ksv) for Mercury(II) was found to be 0.3 ppb and 1.07×10^6 M^{-1} respectively. The fluorescence quantum yield was found 71%. The sensing activity for Mercury(II) was finally tested with real water sample to see its future applicability. The fluorescence sensing mechanism was studied. The characterizations of the synthesized materials were performed by various spectroscopic techniques.

Keywords: Metal-organic framework, graphitic carbon nitride quantum dots, fluorescence sensing, Mercury(II), water.

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FAST 2.0/PP/72

Studying the effect of different drying methods on phenolic content, antioxidant activity, color and antimicrobial activity in Assam tea (Camellia Assamica)

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[3,4] Department of Food Technology & Biochemical Engineering, Jadavpur University, Kolkata 700032, India

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Abstract:

The present study was conducted to determine the effect of freeze drying (FD), vacuum drying (VD), sun drying (SD) and hot air oven (HD) drying on antioxidant activity, antimicrobial activity and color of Camellia Assamica (two samples) collected from Kokrajhar area, Assam. The objective of this study is to observe effect of different drying methods on antioxidant, antimicrobial activity and color of Camellia Assamica. In the experiment, to determine the antioxidant activity DPPH assay was used. Color of the tea samples are measured with Haunter Lab colorimeter and antimicrobial activity is done by disc diffusion method against E.coli. Experimental evidence has shown that freeze drying exhibit rich source of polyphenol content and flavoind content than the vacuum drying, normal drying and hot air oven drying present in tea. The maximum TPC calculated was 194.5±9.72, TFC of 58.7±2.93 (mg of QAE /gm tea extract), with an antioxidant activity of 87.22% amongst both the samples at -40^{o}c, 72hr in FD. The color analysis for the FD sample was found to be lighter than other drying method at-40^{o}c, 72hr with ΔL^{*}=41.3 CIE units, ΔE= 47.8 CIE units, ΔC= 25.6 CIE units and ΔH= 70.06^{o} and analytically cholorophyll was found to be Ch-a=2.23 (mg/gm), Ch-b=1.88 (mg/gm), in comparison of both the samples. The maximum inhibition zone was formed of 4.3 cm for FD and against 3cm for VD sample.

Keywords: Freeze drying (FD), vacuum drying (VD), sun drying (SD) , hot air oven (HD), Antioxidant Activity, Antimicrobial activity, Color.

Article Highlights:

- Drying is the one of the important step in tea processing. The method of drying have major impact on quality of tea
- Various method of drying can be applied in drying process for tea. Hot air oven drying and sun drying are the most common method.
- The effect of hot air drying are more on antioxidant activity as well in other biochemical present in tea.
- As an alternate to hot air oven drying, freeze drying and vacuum drying method were studied and effect is compared for antioxidant activity, colour and also antimicrobial activity with hot air drying method

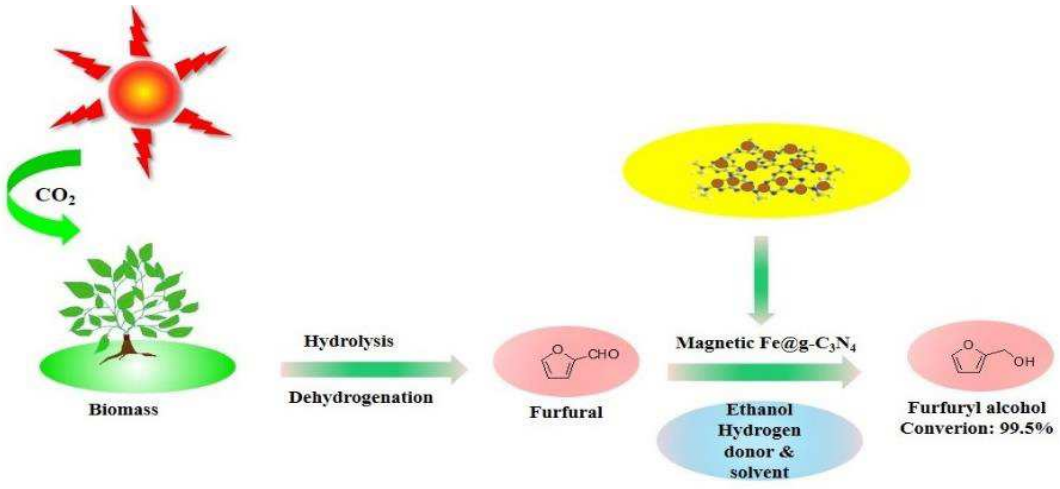
FAST 2.0/PP/73

Highly selective temperature controlled liquid phase transfer hydrogenation of furfural into furfuryl alcohol over 2D g-C_3N_4 supported magnetic ferrite nanoparticles

Purashri Basyach[1], Lakshi Saikia[*1]
[1] Advanced Materials Group, Materials Science & Technology Division, CSIR-North East Institute of Science & Technology, Jorhat, Assam, India.
Email Id- lsaikia@gmail.com

Abstract:

2D graphitic carbon nitride (g-C_3N_4) has recently encountered as the most promising nanocatalyst amongst various supporting nanocatalysts explored.[1] The high nitrogen content makes its surface properties more valuable for catalysis by enhancing its dispersion with other small sized metal or metal oxide nanoparticles. In view of this, a series of economic and environmental benign g-C_3N_4 supported magnetic ferrite nanoparticles (Fe@g-C_3N_4) were synthesized for the catalytic transfer hydrogenation of furfural (FF) into furfuryl alcohol (FFA) using ethanol as a source of hydrogen donor and solvent. Fe being easily available and cost effective has gained enormous interest in biomass conversion. Furfuryl alcohol is an important intermediate in the manufacture of many industrially applicable chemicals like vitamin C, lysine, resins, lubricants, plasticizer and also other important chemicals. Therefore, hydrogenation of FF into FFA becomes a very challenging issue in the field of 'biorefinery'.[2] Excellent furfural conversion of 99.5% with 100% selectivity of desired product furfuryl alcohol was achieved over 0.06Fe@g-C_3N_4 nanoparticles in 3h at 180^{0}C. The catalyst also showed its superior activity even at moderate temperature (90% coneversion of FF at 100^{0}C). The as synthesised catalysts were characterised by PXRD, BET adsorption isotherm, FT-IR spectroscopy, XPS, FESEM, HRTEM etc.



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FAST 2.0/PP/74

Effect of Scalability on performance of Fischer-Tropsch Synthesis in 3D-printed SS Microchannel Microreactors

Nafeezuddin Mohammad[1], Sujoy Bepari[2], Xin Li[2], Debasish Kuila[1,2]*

[1] Joint School of Nanoscience and Nanoengineering, [2]Chemistry Department

North Carolina A&T State University, Greensboro, NC 27411;

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Abstract:

Production of synthetic fuel by Fischer-Tropsch (FT) synthesis has been enjoying tremendous research attention in past few years.[1,2] Although FT synthesis is one of the oldest gas-to-liquid (GTL) technologies, it is still at the infancy stage in terms of scaling up for industrial production. This work is focused on design and scale up strategy of 3D printed stainless steel (SS) micro channel microreactors (1000 µm × 1000 µm × 5cm) for FT synthesis to produce liquid fuels. The process development and intensification for high-pressure FT synthesis with three different scale-up configurations (stand-alone, two, and four microreactors assembled in parallel) was exemplarily studied in terms of catalyst performance using mesoporous CoRu-KIT-6.[1] All three microreactor configurations have shown not only comparable CO conversion (85.6% to 88.4%) and methane selectivity (~14%) but also similar selectivity towards lower hydrocarbons like ethane, propane, and butane (6.23% to 9.4%). The overall selectivity to higher hydrocarbons C5+ is in the range of 75% to 82% at 20 bars. The results show that the scalability of microreactors has no noticeable effect on catalyst performance in terms of CO conversion and the hydrocarbon selectivity at 240 ° C, ~6000 GHSV and H_2/CO of 2. The catalyst is remarkably stable in terms of CO conversion until 180 hours of time on stream with a ~11% drop in CO conversion. These results serve as a proof of concept for design and scaling up of FT synthesis by numbering up of the microreactors in parallel. The details on fabrication of SS microreactor, development of the catalyst, and high-pressure studies will be presented.[3]

References:

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2. N. Mohammad, R. Y. Abrokwah, R. G. Stevens-Boyd, S. Aravamudhan, and D. Kuila, "Fischer-Tropsch studies in a 3D-printed stainless steel microchannel microreactor coated with cobalt-based bimetallic-MCM-41 catalysts," Catalysis Today, 2020/02/20/ 2020.
3. 3. Manuscript in preparation.

FAST 2.0/PP/75

Synthesis of Schiff Bases of 5-Nitrosalicylaldehyde with 4,6-Dinitro-2-Aminobenzothiazole, their Transition Metal ion Complexes and Antibacterial Evaluation

Shruti Pramod Ingole*
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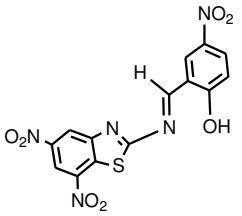
E-mail: shrutipingole@gmail.com

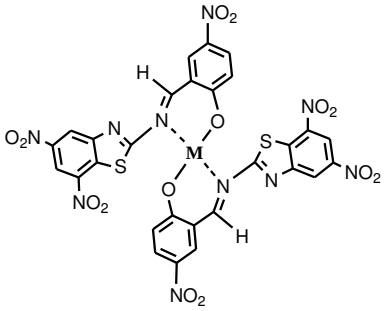
Abstract:

A compound 4, 6-Dintro-2-aminobenzothiazole was reacted with 5-Nitrosalicylaldehyde under acidic condition. The novel imine product has been synthesized by condensation method. Their metal Ligand complexes have been synthesized by refluxing in ethanolic solution. The synthesized compounds were elucidated by H^1 NMR, and IR spectroscopic methods. The prepared compound (Ligand) and metal ion complexes were screened against the Gram +Ve and Gram –Ve bacteria. Almost all complexes have showed good antibacterial activity.

Key-words: - 4, 6-Dintro-2-aminobenzothiazole, 5-Nitrosalicylaldehyde, Schiff bases, Transition Metal- Ligand complexes, Antibacterial Activity.



2-((5,7-dinitrobenzo[d]thiazol-2-ylimino)methyl)-4-nitrophenol



Bis (2-((5,7-dinitrobenzo[d]thiazol-2-ylimino)methyl)-4-nitrophenol) Metal (II)

M= Mn^{++},Co^{++},Ni^{++},Cu^{++},Zn^{++}

References:

1] M.S.Tihile, P.A.Murade; Journal of Chemical and Pharmaceutical Research, 5(2), (**2013),** 5-9.
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FAST 2.0/PP/76

Study the impact of environment friendly Gold nanoparticles on Antheraea assamensis (Muga) silkworm

Rakhi Paul Bhattacharjee* and Lakshi Saikia
Materials Sciences and Technology Division, CSIR-North East Institute of Science and Technology, Jorhat, 785 006, India
Email: rakhi.paul0@gmail.com

Abstract:

Realizing the global demand of environment friendly gold nanoparticles (AuNPs) due to applicability in the field of pharmaceutical and sericulture, AuNPs of different shapes and sizes has been successfully synthesized by using aqueous Ocimum sanctum (Krishna Tulsi) leaf extract (TLE) at different temperature and pH to achieve different properties [1-4]. Recently plant mediated nanoparticles synthesis process has been developed but so far there is no as such report on AuNPs using TLE having fungicidal activity used in the enhancement of silk production [5-8]. The TLE provides effective reducing and stabilizing actions in the preparation of different sized AuNPs from the aqueous solution of $HAuCl_4$ within 3 h. North East India is rich in sericulture, for the golden Muga silk. During rearing, some disease e.g. Flacherie (a bacterial disease) causes decrease in production rate [9].The problem of fulfilling the global market demand of Muga can be solved only by increasing the production rate without compromising with the quality. Here we report that the synthesized smaller sized spherical AuNPs act as an antifungal agent against human pathogen Candida albicans and with optimum dilution of it can enhance the production of silk filament as well as number of eggs in Muga silkworm.

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[1] C. S. Kim, G. Y. Tonga, D. Solfiell and V. M. Rotello, Adv. Drug. Deliv. Rev., 2013, 65, 93-99.
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FAST 2.0/PP/77

Biosorption of Chromium and Vanadium (V) using Abscised Coconut Leaves: An Isotherm, Kinetic and Thermodynamic Study

Ankita S. Gawas, Poonam Sutar and Jyoti S. Gokhale*

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Matunga, Mumbai, India - 400 019
Email: js.gokhale@ictmumbai.edu.in

Abstract:
Chromium (VI) and Vanadium (V) are an industrial toxic waste which endangers the productivity and life of plants, crops and overall agricultural systems. The main aim of this study was the biosorption of chromium (VI) and vanadium (V) using abscised coconut leaves (ACL) powder in a batch operation. The optimized parameters were pH, initial concentration of vanadium, biosorbent dosage, contact time, and temperature. The maximum adsorption capacity for vanadium (V) was obtained at pH 2, initial vanadium (V) concentration of 100 mg/L, and sorbent dosage 10g/L with 98% removal efficiency whereas for chromium (VI) was found to be at pH 1, 100 mg/l initial Cr(VI) concentration, sorbent dosage 10 g/l with 99% removal efficiency. The ACL powder was further used in a packed bed column and performance data were tested for various mathematical models in order to predict scale up design parameters such as breakthrough time and column height. ACL powder was also used to check its applicability on industrial wastewater. The desorption of vanadium (V) was also been studied.

Keywords: Abscised coconut leaves; Vanadium (V); Chromium (VI); biosorption; Langmuir isotherms; pseudo-second order kinetics.

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FAST 2.0

2nd International Conference on

FUTURE ASPECTS OF SUSTAINABLE TECHNOLOGIES

(Virtual Platform)

Date: 20-21 October 2020

Organised by
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Deemed to be University under MHRD, Govt. of India,
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PROGRAMME

DAY 1, 20 October 2020, TUESDAY

TIME	PROGRAM
	11:30-2.30PM (Day 1, 1st Session) Session Co-ordinators: Dr. Anamika Kalita Deka /Dr. Arunendu Mondal
11:30-11:45AM	**INAUGURATION** **Speech of Convener:** Dr. Pranjal Kalita, Associate Professor, Dept. of Chemistry, CITK **Welcome Speech:** Ms. Chiatali Bramha, Registrar, CITK **Welcome Speech and Opening of e-Abstract Volume:** Prof. Debkumar Chakrabarti, Director, CITK
11.45-12.30AM	**KEYNOTE SPEAKER** **Dr. Rajiv Kumar** Ex-Chief Scientist and Consultant, Tata chemicals and Innovation Center, Ex-HoD of Catalytic Division, NCL,Pune Title: Catalysis for highly selective and sustainable organic transformations.
12.30-1:15PM	**KEYNOTE SPEAKER** **Prof. Karen Wilson** Applied Chemistry and Environmental Science RMIT University, Melbourne, Australia Title: Designing advanced catalytic materials for biorefining of waste biomass
1:15-2:15PM	***LUNCH BREAK***
	2:15-6.05PM (Day 1, 2nd Session) **Session Co-ordinators: Dr. Bhaskar Saha/Mr.Ranjan Patowary**
2:15-2:35PM	**INVITED SPEAKER** **Dr. Bipul Sarma** Assistant Professor, Department of Chemical Science Tezpur University, Tezpur, Assam, India Title: Control Drug Nucleation on SAMs

2.35-4:05 PM (Day 1, 2nd Session)

ORAL PRESENTATIONS

Session Chair: Dr. Vivek Polshettiwar

OP1(2:35 - 2:45PM)	**Biosynthesis of triangular-shape ZnO nanoparticles using Tecomastans and its antimicrobial activity,** Lalthazuala Rokhum, Department of Chemistry, University of Cambridge, Lensfield Road, Cambridge CB2 1EW, UK
OP19(2.45-2.55PM)	**An Invasive Weed Optimization coupled Biomass and Product Dynamics study of Soyabean Waste utilzation towards Fungal Lipase Production,** Surendra Kumar Parashar, Department of Chemistry and Chemical Engineering, Jaypee University of Engineering and Technology, Guna, Madhya Pradesh, India
OP3(2.55-3.05PM)	**GREEN TECHNOLOGY TO CONVERT PLASTIC WASTE TO FINE CHEMICALS** Amita Chaudhary, Institute of Technology, Nirma University, Ahmedabad, India
OP21(3.05-3.15PM)	**Adsorption of Industrial Dye from Its Aqueous Solution by Acid Treated Bioadsorbent White Frangipani,** Jahnabi Deka,Department of Chemistry, Gauhati University, Guwahati, Assam, India
OP5(3.15-3.25PM)	**Divergent reactions of Indoles,** Pranjal K. Baruah, Department of Applied Sciences, Gauhati University, Guwahati, Assam, India
OP6(3.25-3.35PM)	**Complete oxidation of propene using ceria modified Cu/Hydroxyapatite catalyst: Effect of preparation method and Ce concentration** P.M. More, Department of Chemistry, Institute of Chemical Technology, Matunga, Mumbai-400019, India.
OP7(3.35-3.45PM)	**Plumeriarubra f. rubra: A Novel Ligand for Cupric Ion Detection** Ankur H. Dwivedi, Department of Chemical Engineering, School of Engineering, Institute of Technology, Nirma University, Ahmedabad-382481, INDIA
OP8(3.45-3.55PM)	**Recovery of Lignin from pulp and paper mill effluent by forward osmosis process** S. Basu, National Institute of Advanced Manufacturing Technology (NIMT), Ranchi, Jharkhand-834003, India
OP9(3.55-4.05PM)	**Greener synthesis of acridiniumphotocatalysts and their application towards efficient organic transformations** Biswajit Gopal Roy, Department of Chemistry, Sikkim University, 6th Mile, Tadong, Gangtok, Sikkim – 737102, India
4:05-4.25PM	**INVITED SPEAKER** **Dr. Shivendu Ranjan** Faculty of Engineering and the Built Environment, University of Johannesburg, Auckland Park Campus, South Africa Title: Environmental, Health, and Safety Implications of Nanomaterials: Critical Issues

4.25-6.05 PM (Day 1, 2nd Session)

ORAL PRESENTATIONS

Session Chair: Dr. Shivendu Ranjan

OP10(4.25-4.35PM)	**Two-step Conversion of Levulinic Acid from Biomass Derivatives Using Autogenous Catalyst and H-Mordenite Zeolite,** Bharath Velaga, Department of Chemical Engineering, Indian Institute of Technology Guwahati, India.
OP11(4.35-4.45PM)	**Diversity Oriented Synthesis of Biologically Active Heterocycles using Sustainable Technologies** Kaushik Chanda, Department of Chemistry, School of Advanced Science, Vellore Institute of Technology, Vellore, India
OP11(4.45-4.55PM)	**Design of Environmentally Benign Nano-Lignin Sol for Different Applications.** Surojit Gupta, Department of Mechanical Engineering, University of North Dakota, USA.
OP12(4.55-5.05PM)	**Biochemical Composition and Nutritional Value of Small Indigenous Fish species Amblypharyngodon mola from Kokrahjar, Assam, India.** Dr. Sharmistha Chakraborty, Department of Chemistry, Science College, Kokrajhar, Kokrajhar, BTR, Assam, India.
OP13(5.05-5.15PM)	**Towards the upgrading of lignocellulosic biomass: An efficient approach for the synthesis of bio-fuel intermediates over γ-Alumina Supported Sodium Aluminate** Kempanna S. Kanakikodi, Materials Science & Catalysis Division, Poornaprajna Institute of Scientific Research (PPISR),Bangalore, India.
OP14(5.15-5.25PM)	**Effect of Wettability on Vacuum-driven Bubble Nucleation** Sushobhan Pradhan, School of Chemical Engineering, Oklahoma State University, Stillwater, OK 74078, USA
OP15(5.25-5.35PM)	**Green synthesis of ZnO nanoflowers using Oxalis corniculata extract** Hina F Badgujar, School of Nano Sciences, Central University of Gujarat, Gandhinagar-382030, Gujarat, India
OP16(5.35-5.45PM)	**A broad review on Arginine and its application in dentistry** Dr. Antarikshya Das, Kalinga Institute of Dental Sciences. Campus 5, KIIT University, Patia road, Bhubaneswar, Odisha, India
OP17(5.45-5.55PM)	**A low-cost rechargeable battery with aluminum and graphite** Dr. Shyamal Kumar Das, Department of Physics, Tezpur University, Assam, India
OP18(5.55-6.05PM)	**A sustainable approach of tuning Potato waste towards Bioethanol production using Indigenous microbes of Himachal Pradesh, India** Mamta Chauhan, Crop Physiology, Biochemistry and Post-Harvest Technology. Division, ICAR-Central Potato Research Institute, Shimla, Himachal Pradesh, India.

5:00-7:30PM POSTER PRESENTATIONS (Google Meet)

Group 1: PP1-PP25 (https://meet.google.com/xdq-urut-gtq)

Group 2: PP26-PP50 (https://meet.google.com/rib-efzz-ikc)

Group 3: PP51-PP77 (https://meet.google.com/bof-uxji-awq)

DAY 2, 21 October 2020, WEDNESDAY

11:30-2.30PM (Day 2, 1st Session) Session Co-ordinators: Dr. Kaushik Chandra Dev Sarmah/ Mr RanjanPatowary	
11:30-11:50PM	**INVITED SPEAKER** **Dr. Bharat Baruah** Professor, Kennesaw State University, Atlanta, USA Title: Fabrication of Composite Materials Containing Nanostructured Metal Oxide Semiconductor and Polymer Capped Plasmonic Nanoparticles: Photocatalysis
11:50-12:10PM	**INVITED SPEAKER** **Dr. Arunendu Mondal** Associate professor, Department of Chemistry, CIT Kokrajhar, Assam, India Title: A review on development of metal-organic frameworks (MOFs): Synthetic approach and applications
12:10PM-1:30PM **ORAL PRESENTATIONS** **Session Chair Person: Dr. Vivek Polshwhettair**	
OP2 (12:10-12:20PM)	**An efficient colorimetric sensor for the detection of cyanide ions by hydrazide derivatives.** Balamurali MM, Chemistry Division, School of Advanced Sciences, Vellore Institute of Technology, Chennai, India.
OP20(12.20-12.30PM)	**Purification Of Crude Bentonite Clay, Characterization And Base Catalytic Application Of Cu-Modified Bentonite Clay** Debasis Borah, Department of Chemistry, Bodoland University, Kokrajhar, Assam, India
OP4(12.30-12.40PM)	**Diversity Oriented Synthesis of Biologically Active Heterocycles using Sustainable Technologies.** Kaushik Chanda, Department of Chemistry, School of Advanced Science, Vellore Institute of Technology, Vellore, India.
OP22(12.40-12.50PM)	**Controlling and stabilization of Ru nanoparticles by tuning the nitrogen content of the support for enhanced H2 production through aqueous phase reforming of glycerol** Pranjal Gogoi, CSIR-National Chemical Laboratory, Pune-411008, Maharashtra, India
OP 29 (12.50-1.00PM)	**Fabricating Green ZnO Nanoparticles Using Aqueous Extract of Coconut Husk for Photocatalytic Activity** Manasi Buzar Baruah, Department of Physics, Central Institute of Technology Kokrajhar (Deemed to be University, MHRD, Govt. of India), Kokrajhar, Assam, India..
1.00-2.00 PM	**LUNCH BREAK**

	2:20-4.00PM (Day 2, 2nd Session) Session Co-ordinators: Dr. Sahalad Borgoyary/Mr. Sajib Narzary
2.00-2.20 PM	**INVITED SPEAKER** **Dr. Vivek Polshettiwar** Department of Chemical Science (TIFR), Mumbai, India Title: "Nanocatalysis: A Key Role for Sustainable Energy and Environment"
2.20-2.40 PM	**INVITED SPEAKER** **Dr. Lakshi Saikia** Sr. Scientist, Material Science Division, CSIR-North East Institute of Science and Technology, Jorhat, India Title: 2D nanocomposite materials for sunlight driven benzene hydroxylation and environmental remediation
2.40-4:00PM **ORAL PRESENTATIONS** Session Chair Person: **Dr. Lakshi Saikia**	
OP 24(2.40-2.50 PM)	**Preparation and characterization of Chitosan based biocomposite thin films using Tectonagrandis as an active component** Jutika Goswami, Department of Chemistry, Assam Engineering College, Jalukbari, Guwahati, Assam, India.
OP25(2.50-3.00PM)	**Green Synthesis of Fatty Acid Methyl Esters through Entrapped Lipase-mediated Transesterification** Vijay Kumar Garlapati, Microbial Biotechnology and DSP Laboratory, Agricultural and Food Engineering Dept, IIT Kharagpur, West Bengal, India.
OP26(3.00-3.10PM)	**Magnetically active $CuFe_2O_4$ as heterogeneous catalyst for the synthesis of pyrido[2,3-d]pyrimidines, 1,2,3-triazoles and 3, 5-diaryl-1H-pyrazoles** Lakhinath Saikia, Department of Chemistry, Rajiv Gandhi University, Rono-Hills, Itanagar, Arunachap Pradesh, India.
OP27(3.10-3.20PM)	**Advanced Materials for Vertically Aligned Liquid Crystal Displays** Sarmistha Mondal, Department of Electronics and Communication Engineering, Siliguri Institute of Technology, Siliguri , India.
OP28 (3.20-3.30 PM)	**Optical, Transport and Magnetic behavior of Ca-modified new double perovskite** Sourav Bhattacharjee, Department of Physics, Central Institute of Technology, Kokrajhar (Deemed to be University, MHRD, Govt. of India), BTAD Assam-783370
OP23(3.30-3.40PM)	**Experimental Investigation of Biosurfactant with Nanoparticles for Enhanced Oil Recovery** Sanket J. Joshi, Oil & Gas Research Center, Sultan Qaboos University, Muscat, Oman
OP30(3.40-3.50PM)	**Ethnic Food Beverages: Identification of Sustainable Compounds** Anamika Kalita Deka, Department of Chemistry, Central Institute of Technology Kokrajhar (Deemed to be University, MHRD, Govt. of India), Kokrajhar, Assam, India.

OP31(3.50-4.00PM)	**Charge-assisted Hydrogen bonds and Nitrile···Nitrile interactions directed assemblies in Coordination Complexes: Anticancer activities and Theoretical Studies** Pranay Sharma, Department of Chemistry, Cotton University, Guwahati-781001, Assam, India.
4:00-4.15 PM **Prize Distribution & Valedictory Function**(Session Co-ordinator:Dr. Manasi Buzar Baruah)	
4.15-4.45 PM **Vote of Thanks**	

Cisco Webex Software for FAST 2.0 Conference Links:

Day 1 Schedule 1: 11:30-1:30: Tuesday

International Conference FAST 2.0. Oral Presentation (Day 1 Session 1)

Tuesday, Oct 20, 2020 11:30 am | 2 hours | (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi
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Password: FAST2020D1S1
https://citkokrajhar.webex.com/citkokrajhar/j.php?MTID=m5db6f5c0efe997d41725ec3c8fe55618

Day 1 Schedule 2: 2:30-7:30 Tuesday

International Conference FAST 2.0. Oral Presentation (Day 1 Session 2)

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Day 2 Schedule 1: 11:30-1:30

International Conference FAST 2.0. Oral Presentation (Day 2 Session 1)

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Day 2 Schedule 2: 2:30-7:30

International Conference FAST 2.0. Oral Presentation (Day 2 Session 2)

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FAST 2.0

2nd International Conference on

FUTURE ASPECTS OF SUSTAINABLE TECHNOLOGIES

(Virtual Platform)

Organised by
Department of Chemistry,
Central Institute of Technology Kokrajhar,
Deemed to be University under MHRD, Govt. of India,
Kokrajhar, BTR, Assam-783370, India.

Themes

1. Chemical, Physical & Biological Science
2. Green Synthesis & Technology
3. Waste Management
4. Porous Materials
5. Material Sciences
6. Green Energy
7. Nanoscience & Nanotechnology
8. Catalysis

CALL FOR PAPERS

The abstract of paper (not exceeding 200 words) should be submitted to fast2019.cit@gmail.com by 17 Oct-2020. The decision of the organizing committee for the acceptance / rejection will be final. The authors are requesed to submit their abstracts in the following format.

1. Font type: Times New Roman.
2. Title: A concise title with font size 14 and Bold.
3. Author: Font size 12, regular and star mark (*) of the corresponding author.
4. Affiliation with address and email id: Font size 10, regular.
5. Passport size photograph pasted at the right corner of the abstract and short bibliography at the end.

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INVITED SPEAKERS

Dr. Rajiv Kumar
Ex-Chief Scientist and Consultant, Tata Chemicals and Innovation Center; Ex-HoD of Catalysis Division, NCL, Pune, India

Prof. Karen Wilson
Applied Chemistry and Environmental Science
RMIT University, Melbourne, Australia

Dr. Shivendu Ranjan
Faculty of Engineering and the Built Environment
University of Johannesburg
Auckland Park Campus, South Africa

Dr. Bharat Baruah
Professor, Department of Chemistry
Kennesaw State University, Atlanta, USA

Dr. Vivek Polshettiwar
Department of Chemical Sciences
Tata Institute of Fundamental Research (TIFR)
Homi Bhabha Road, Colaba, Mumbai, India

Dr. Lakshi Saikia
Sr. Scientist, Materials Science Division, CSIR-North East Institute of Science and Technology, Jorhat, India

Dr. Arunendu Mondal
Associate Professor & Head
Department of Chemistry, CIT Kokrajhar, Assam, India

Dr. Bipul Sarma
Assistant Professor, Department of Chemical Sciences,
Tezpur University, Tezpur, Assam, India

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FAST 2.0

This conference provides a forum for academcians, researchers, developers and industry professionals to exchange their valuable ideas and showcase the ongoing works which may lead to path breaking foundation of the futuristic growth in science, engineering and technology. The aim of this conference is to deliberate and disseminate knowledges on various aspects of interdisciplinary sciences, integrated systems, global and local issues, state of the art science and technologies. This conference will bring together the academicians, scientists, engineers and manufacturers from various institutions, universities, colleges and industries to discuss the relevance of various futuristic emerging technologies in this area throughout the world and share their views.

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