

Ag(I), Au(I/III) and Pt(II) -N-Heterocyclic Carbene (NHC) as Antibacterial and Anticancer Drugs

Dr. Joydev Dinda

P.G. Department of Chemistry, Utkal University, Bhubaneswar-751004, Odisha, India.

E.mail: joydevdinda@gmail.com

The serendipitous discovery of cisplatin in 1969 by Rosenberg opened widespread research interest in the area of metal-based drugs. In cisplatin the major antitumour activity originates from intrastrand cross links and the formation of DNA kinks. Genomic DNA is mostly the target for platinum drugs. Therefore, DNA targeting drugs remain in the limelight and compounds acting towards cancer cells selectively over healthy cells. Cisplatin has long been used as antitumor drug; it suffers from nephrotoxicity and drug resistance potential efficacy. The outstanding activity of cisplatin against cancer recommends that, it would be also possible to synthesize other metal-based anticancer drugs. Recently reported Auranofin is an FDA-approved gold-containing compound used for the treatment of rheumatoid arthritis. Antimicrobial activity against protozoa and bacteria indicate that auranofin targets the reductive enzyme thioredoxin reductase (TrxR). Efficacy of auranofin as anticancer drug is also recently proved. As Pt(II) and Au(III) is isoelectronic and seems to offer similar geometry, therefore it is expected Au(III) complexes will also be promising like cisplatin. N-heterocyclic carbene (NHC) ¹ which a biologically ubiquitous ligand can stabilize various oxidation state of most the metals of the periodic table and the complexes are stable in air and moisture. Therefore our interest remain on gold(I/III)- and platinum(II)-NHC complexes ² which are very potent against several cancer cell line.

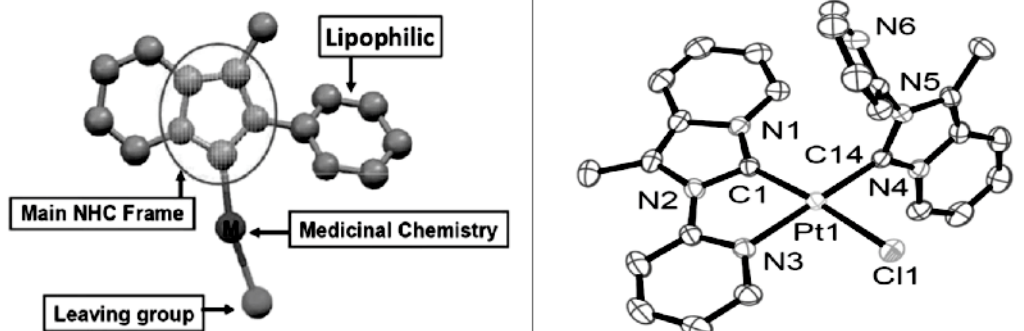


Fig.1. ORTEP view of Au(I)-NHC and cationic part of Pt(II)-NHC

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Microwave assisted Iron(III)chloride catalyzed one-pot reaction for chromene fused pyrrole/imidazo[1,2-a]pyridine derivatives

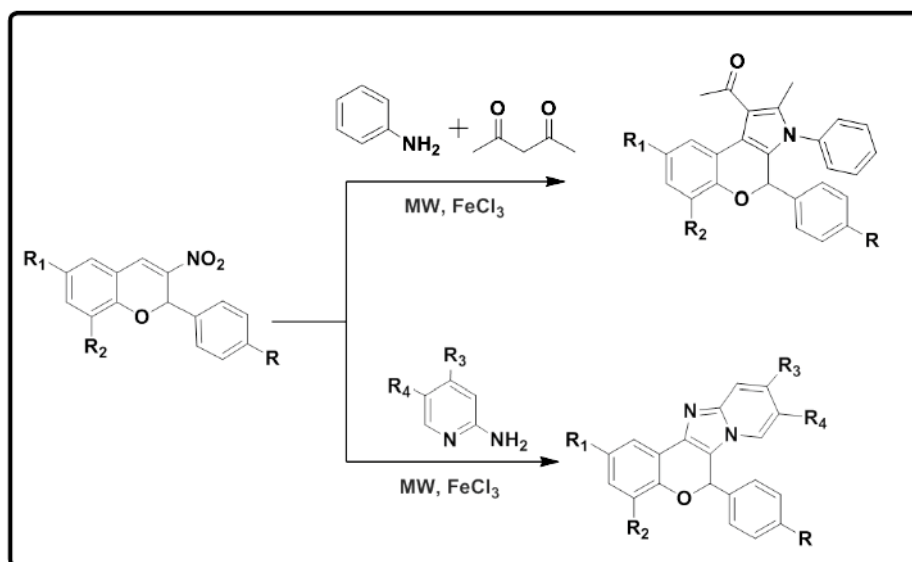
Seetaram Mohapatra,^{a*} Mitali Mishra,^a Nilofar Baral,^a Sabita Nayak^a

^aOrganic Synthesis Laboratory, Department of Chemistry, Ravenshaw University, Cuttack-753003, Odisha, India

E-mail: seetaram.mohapatra@gmail.com

Abstract:

Functionalized chromenes are one of the most important heterocyclic scaffolds present in many natural products.¹ Among them, 3-nitro-2H-chromenes have a wide range of biological properties, such as anticancer, antitumor, antiproliferative activity, P2Y6 receptor antagonists.² Recently, chromene fused heterocyclic molecules have proven to be a fundamental structural building block in many pharmaceuticals.³ Also, iron(III) catalyzed one-pot reaction under microwave irradiation method denoted as one of the most advancing ones for the development of chromene fused heterocyclic molecules.⁴ In recent time, pyrrole and imidazo[1,2-a]pyridine derivatives are emerged as a significant pharmaceutical core. Therefore, we have developed a series of chromene fused pyrrole/imidazo[1,2-a]pyridine derivatives under microwave irradiation method using iron(III) chloride as catalyst in good to excellent yield. In addition, this series of chromene fused pyrrole/imidazo[1,2-a]pyridine derivatives may prove as a new class of biologically active compound for biomedical screening in near future.



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Amide Functionalized Triazole Containing Glycoconjugates as Potential Hydrogels

Chinmayee Pattnaik,^a Satyanarayan Choudhury,^a Anadi Singhamahapatra,^b Laxmi Narayan Sahoo,^c and Satyanarayan Sahoo^a

^aP. G. Department of Chemistry, Berhampur University, Odisha, 760007

^bDepartment of Chemistry, Saraswati Degree Vidya Mandir, Berhampur, Odisha, 760002

^cDepartment of Chemistry, Government Science College Chatrapur, Odisha, 761020

E-mail: sns.chem@buodisha.edu.in

Carbohydrate functionalized low molecular weight hydrogels can be potentially useful for synthesis of various soft materials. These materials can be used as carriers for controlled drug release, absorption of dyes and functional coating layer for application in biotechnology and tissue engineering. In this present study, a library of carbohydrate containing glycoconjugates have been synthesized starting from propargyl amine based on 'click chemistry' in excellent yields with high purity. The synthesized compounds were characterized using various spectroscopic techniques. These hybrid glycolipids, functionalized with either carboxamide or sulphonamide or both in combination with triazole linkage, were found to form stable hydrogels in a variety of solvents or mixture of solvents including ethanol, DMSO in combination with water. The application of these hydrogels in the field of material science is under progress

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Thiourea based Colorimetric Chemosensor for Selective Detection of Anions

BhagabanaMuni,^aChinmayee Pattnaik,^aAnadi Singha mahapatra,^b
Laxmi Narayan Sahoo,^c and Satyanarayan Sahoo^a

^aP. G. Department of Chemistry, Berhampur University, Odisha, 760007

^bDepartment of Chemistry, Saraswati Degree Vidya Mandir, Berhampur, Odisha, 760002

^cDepartment of Chemistry, Government Science College Chatrapur, Odisha, 761020

E-mail: sns.chem@buodisha.edu.in

Design and synthesis of a suitable chemosensor, capable of sensing biologically and chemically important anions is a challenge in supramolecular chemistry. Much attention has been given on the synthesis of simple colorimetric sensors which allows detection of anions without use of sophisticated instruments. Among the various anions, fluoride ion plays an important role in prevention of dental caries and bone formation. Fluoride is absorbed by the teeth and protects teeth against decay. Acetate ion has also attracted much attention due to participation of acetate group in different metabolic activities in human body. Though, there are many chemical sensors available in literature for anion detection, the development of efficient, cost effective and durable sensors is still a challenging problem in chemical science. The present work describes synthesis of thiourea ligands using simple synthetic methodology. The ligands were characterized by different spectroscopic techniques and structural elucidation was done by single crystal X-ray crystallography. The interaction and sensing of the ligand with different anions were investigated through naked eye, as well as by UV-Visible, Fluorescence, ¹H NMR spectroscopy. These experimental results were further corroborated with the quantum chemical calculations.

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Nanostructured Hybrid Materials for Sensing Applications

Sarat K Swain

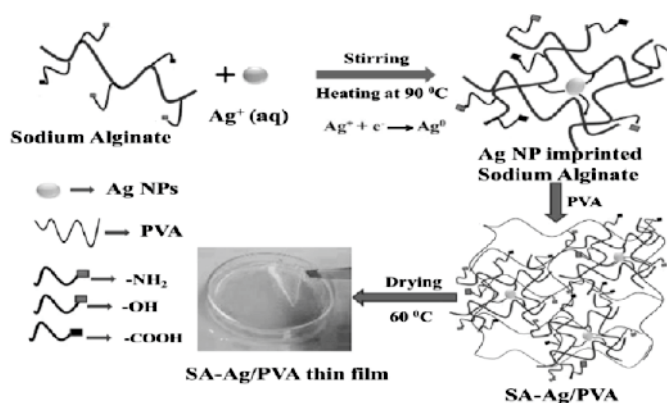
Department of Chemistry, Veer Surendra Sai University of Technology,

Burla, Sambalpur 768018

E-mail : skswain_chem@vssut.ac.in

Phone: 91-9937082348

Nanostructured hybrid materials have been accepted as potential candidate for various applications in areas of sensing, biomedical, transport, semiconducting, packaging including other engineering applications due to their versatile and unique properties. Out of different applications, sensing behaviour of the nanocomposite materials has attracted special attention in the field of water purification, glucose monitoring, amino acid sensing as well as bioimaging. Various novel non-toxic metal-based nanoparticles have been successfully used in combination with different polymeric materials to form hybrid nanocomposites to serve the purpose of sensing. The materials have been synthesized using green techniques, using water as solvent. The sensing of different components like heavy metals, amino acids or other biomolecules have been studied using UV-vis spectroscopy or fluorescence method (on-off mechanism). The use of hybrid nanocomposites have successfully detected the presence of heavy metals like Hg^{2+} , with high selectivity and low limit of detection (up to 0.9 ppb). The practical sensing activity of the prepared nanocomposite films is tested by varying different parameters like contact time, temperature, pH of the analyte medium. Different synthesized nanocomposites have proved to be efficient in sensing heavy metals at different pH and temperature detection of ranges. Scheme 1 illustrates the synthetic mechanism of preparation of sodium alginate/polyvinyl alcohol nanocomposite films incorporated with Ag Nps for detection of Hg^{2+} ions in water samples for the purpose of water purification.



Scheme 1: Preparation of SA-Ag/PVA nanocomposite films for detection of Hg^{2+}

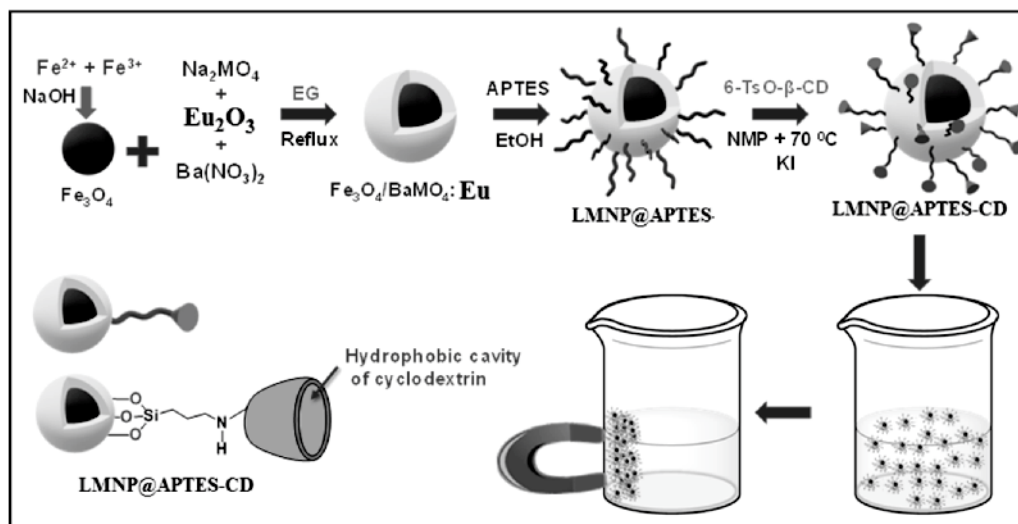
Luminescent magnetic nanoparticles for Application as a Drug Carrier

Dr. Ganngam Phaomei

P.G. Department of Chemistry, Berhampur University

E-mail : g.phaomei@gmail.com

Magnetic nanoparticles, based on luminescent properties attracted much attention in recent times particularly in bio-medical applications. Two such applications are in biosensing and drug carrier. Drug carrier development is challenging due to short comings like low solubility, uncontrolled distribution, and adverse effect on normal cell. Thus proper delivery of the drug with suitable carrier that can deliver sight to the targeted area is important. Nanomaterial, especially in core-shell geometries, can fulfill these requirements. A magnetic, luminescent nanoparticle has an added advantage, of facilitating imaging in addition acting as a drug carrier. Magnetic luminescent nanoparticles can be used as suitable coating material in bio-sensing applications, for example in a clad removed optical fibre. Here, a novel magnetic, luminescent core-shell nanoparticle is synthesized and characterized for drug carrier and sensing applications. The synthesis scheme is shown as below.



Synthetic approach in Cyclodepsipeptide: Celebesides

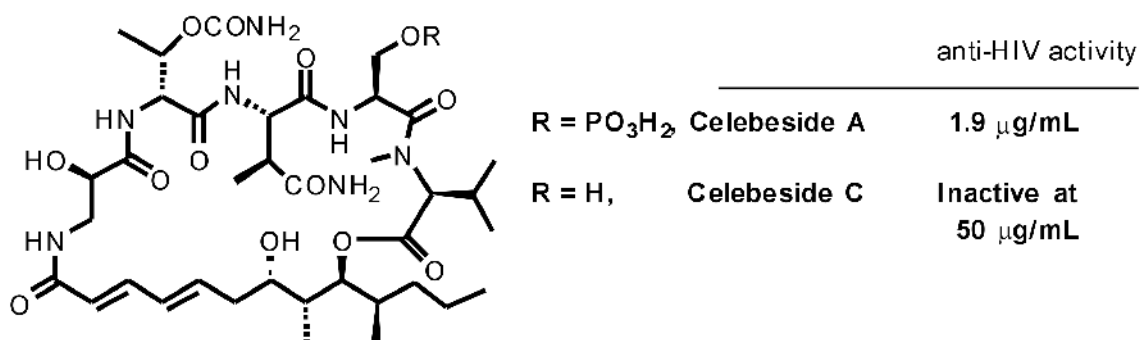
Dr Bibhuti Bhusan Parida*

bbp.chem@buodisha.edu.in

P. G. Department of Chemistry, Berhampur University, Berhampur, Odisha

Abstract :

Depsipeptides from natural sources exhibit diverse biological properties. Cyclic depsipeptides are well known for exhibiting a wide-range-spectrum of biological activities. Naturally occurring cyclic depsipeptides have emerged as an important source of pharmacologically active compounds or promising lead structures for the development of novel synthetically derived drugs. Depsipeptides produced by fungi, actinomycetes, cyanobacteria, higher plants and marine organisms. The celebeside A inhibited HIV-1 entry with an IC_{50} value of $1.9 \pm 0.4 \mu\text{g/mL}$. Diverse biological activities, fascinating architecture and the challenges to synthesize the depsipeptides made them as attractive targets for their total syntheses. Celebesides synthesis commences with readily available starting materials following novel approaches.



Keywords: Cyclodepsipeptides, anti-HIV, Total synthesis, Celebeside A and C,

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SrSn_{1-x}Fe_xO₃ (x=0-0.2) Perovskite Oxides as Promising Functional Materials for Oxygen Sensor

Dr SunasiraMisra*

*Assistant Professor at P.G. Department of Chemistry,
Khallikote Unitary University (erstwhileKhallikoteAutonomous College),
Berhampur, Odisha 760001*

**(E-mail: misra.sunasir@gmail.com)*

ABSTRACT :

Cubic phase (S.G.: P23) of iron substituted strontium stannate, SrSn_{1-x}Fe_xO₃ (x = 0, 0.05, 0.1, 0.15 and 0.2) were prepared by solid state reaction method. Linear decrease in lattice parameter with iron (Fe) substitution was observed using powder X-ray diffraction method. Electrical conductivity measured on bulk pellets of the above compositions using AC impedance spectroscopy shows that this functional material is a mixed ion & electron conductor (MIEC) and the conductivity increases with the Fe dopant concentration. The activation energy (E_a) deduced from their Arrhenius plots are in the range of 0.3 – 0.5 eV which implies that the mechanism of electrical conduction is same for all the compositions. X-ray photoelectron spectra show a divalent state for Sr, tetravalent state for Sn and a divalent state for oxygen irrespective of the composition leaving only Fe responsible for the increase in conductivity. Mössbauer spectroscopy studies reveal that Fe-ions in tetravalent, trivalent and divalent states with their relative proportion remain more or less same across the compositions. The increase in conductivity is mainly due to Fe³⁺ and/or Fe²⁺ ions because the isovalent Fe⁴⁺ substituted for Sn⁴⁺ do not contribute to changes in electrical conductivity as SrSnO₃ being an insulator with all Sn-ions in +4 valence state. Oxygen partial pressure dependence electrical conductivity studies of SrSn_{1-x}Fe_xO₃ (x = 0, 0.05, 0.1, 0.15 and 0.2) shows that SrSn_{0.9}Fe_{0.1}O_{3-δ} and SrSn_{0.85}Fe_{0.15}O_{3-δ} exhibit significant change in conductivity as function of oxygen partial pressure and have the potential to be tailored/engineered as percentage level oxygen sensors. Of these two compositions, SrSn_{0.85}Fe_{0.15}O_{3-δ} has less interference from moisture and therefore a more promising material.

Keywords: 1. Substituted perovskites; 2. MIEC; 3. Electrical conductivity; 4. p-type semiconductor; 5. Oxygen Sensor

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*Oral
Presentation*

Palladium Catalysis in Aryls, Heterocycle Scaffolds Synthesis

Smitabala Panda and Dr. Bibhuti Bhusan Parida*

1smitabala.panda@gmail.com

P.G. Department of Chemistry, Berhampur University, Odisha

Abstract :

Heterocycles have a wide spectrum of biological activities and are used as FDA-approved potential drugs. Indolizidine analogues have various pharmacological properties like anti-cancer, analgesic, antibiotic, antioxidant, central nervous system depressant, larvicidal, and antiretroviral as reported. So, there is a need for sustainable synthesis of different heterocyclic compounds including Indolizidine derivatives of medicinal relevance. Palladium-catalyzed cross-coupling reactions play an important role in the organic synthesis of diverse heterocyclic scaffolds. Through a Pd-catalyzed cross-coupling of cyclopropanol with various acyl chloride derivatives 1, 4-diketone could be synthesized which acts as the building block for organic synthesis of many biologically active heterocycles. Similarly, diverse heterocycles, aryl and hetero aryl compounds have been synthesized by Pd-and other metals (copper, rhodium, nickel etc.) catalyzed coupling reactions to further its scope in organic synthesis and its use in drug discovery. These types of coupling reactions were synthesized using green solvent which includes green approach in organic synthesis. Various analogues of natural products, have been synthesized through such approaches.

Key words : Total synthesis, Heterocycles, Aryls, Indolizidines, anti-cancer.

Study of Inclusion complexes of 4-Thiazolidinone Derivatives with β -cyclodextrin Characterization, Phase solubility and inclusion mode

Dr. Simanchal Dash

Department of Chemistry

Roland Institute of Technology, Berhampur, Odisha, India, Email.dash.simanchal73@gmail.com

ABSTRACT : 4-Thiazolidinone and its derivatives attracted large attention owing to its diverse pharmaceutical applicability and usefulness for the society. In this context, two important 4-thiazolidinone compounds namely 2-o-Chloro phenyl 3-(Benzothiazolyl-2')hydrazono-5-arylidene-4-thiazolidinone and 2-o-Chloro phenyl 3-(Benzothiazolyl-2')hydrazono-5-p-anisilidene-4-thiazolidinone are synthesized by taking 2-hydrazino benzothiazole as a starting material. However these compounds are less soluble and little extent bioaccessible. To eliminate the problem, its inclusion complex has been prepared with β -cyclodextrin. The synthesis of derivatives and inclusion complexes have been ascertained from the changes in spectral characteristics and physical change parameters. Thermodynamic parameters ΔG will predict the formation of complex. Presence of weak intermolecular forces in between host and guest stated by thermodynamic stability constant.

Key words: 2-Hydrazino benzothiazole, spectral, weak intermolecular forces & host.

Green synthesis of zero-valent iron nanoparticles using leaf Extract of *Tridax Procumbens* and study of Application in Removal Cr(VI) from Waste Water.

Laxmi Narayan Sahoo¹, Satyanarayan Sahoo² and Manabendra Patra^{3*}

¹Department of Chemistry, Government Science College, Chhatrapur, Ganjam-761020, Odisha, INDIA

²P. G. Department of Chemistry, Berhampur University, Bhanja Bihar-760007, Ganjam, Odisha, INDIA

³National Institute of Science and Technology, Institute Parks, Pallur Hills, Berhampur-761008, Odisha, INDIA

E.mail: mpatra@nist.edu

Abstract

Zero-valent iron nanoparticles (n-ZVI) were synthesized using leaf extract of *Tridax procumbens*. The zero-valent iron nanoparticles obtained were characterized by XRD and UV-visible spectrophotometer. The adsorption capacity of the n-ZVI for the removal of hexavalent chromium in aqueous solution was studied. The adsorption equilibrium data taken at the optimized condition, i.e., at 30 °C and pH of 3 were analyzed in the light of Langmuir-Freundlich isotherm models.

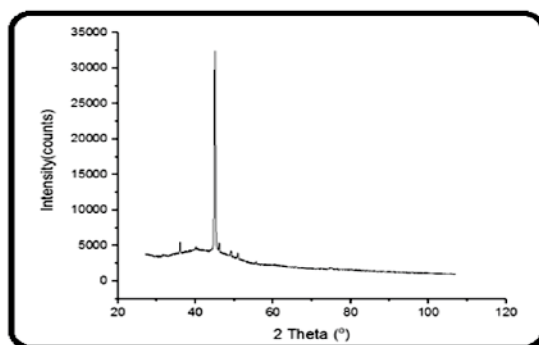


Fig-1: XRD Spectra of Zero-valent iron nanoparticles

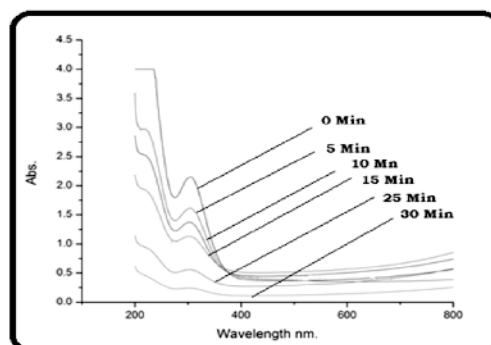


Fig-2: Removal of Cr(VI) with different time

Photo-catalytic degradation of organic pollutants over heterojunction based vanadium phosphate catalyst

Gobinda Chandra Behera

Department of Chemistry, M.P.C. Autonomous College, Baripada, 757003, Odisha, India

ABSTRACT

Vanadium Phosphate (VPO) materials are extensively used in the gas phase oxidation of n-butane to maleic anhydride. Herein we explored the catalytic activity of WO_3 -VPO towards the degradation of organic pollutants. The catalyst showed significant efficacy towards phenol degradation under visible light irradiation with a short span of time. WO_3 -VPO was found as an n-type semiconductor where the photogenerated electrons inhibited the recombination rate of electron-hole pairs. The synergistic interaction between WO_3 and VPO, the formation of a higher number of hydroxyl radicals and inhibition of recombination factors play a major role for obtaining such significant results. Again, the catalysts exhibit a heterojunction phenomenon where the charge separation of e^- - h^+ pairs is more effective than individual one and tends to increase the availability of h^+ which helps to enhance the photocatalytic activity of the WO_3 -VPO. The analysis of photoluminescence (PL) emission spectra, photoelectrochemical measurement and the cyclic voltammeter (CV) measurement of the composite materials greatly support the outstanding results of the catalyst.

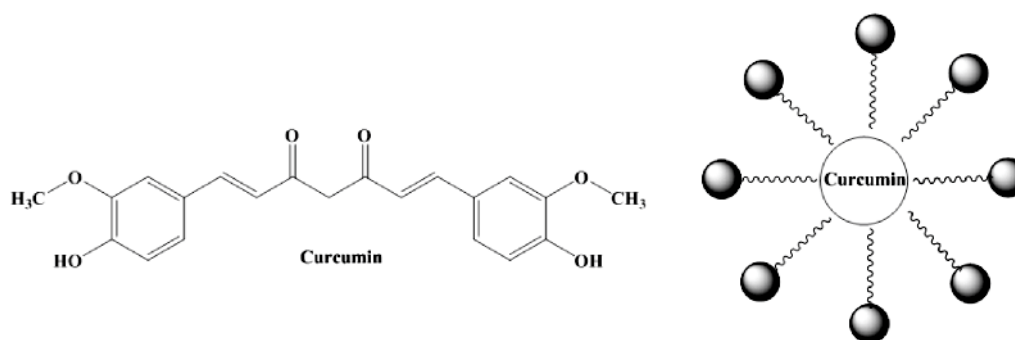
Curcumin Encapsulated Nanoemulsions for Improved Bioaccessibility and Applications

Dr. Anadi Singha Mahapatra and Dr. Subrat Kumar Panigrahy*

Saraswati Degree Vidya Mandir, Neelakanthanagar, Berhampur, Odisha 70002

E-mail: subratssvm@gmail.com

Curcumin is a natural low-molecular-weight polyphenolic compound present in the *Curcuma longa* (turmeric) rhizomes. In addition to its extensive applications in food products it is widely recognized for its beneficial activities in traditional medicines. However, its practical commercial application has remained challenging due to its low aqueous solubility, biochemical/ structural degradation and poor bioavailability. In this regard curcumin-loaded nanoemulsions can provide efficient, systematic, and practical protocols for improved applications of curcumin. In recent years nanoemulsions have gained importance in healthcare and cosmetics sectors as a result of their unique properties majorly influenced by high surface area of the nano droplets. The methods and conditions associated with the production of nanoemulsions will affect their stability and other physicochemical properties which modulate its applications too. For these reasons, many researches are aimed at overcoming these limitations using lipid-based nanosystems to encapsulate curcumin, especially nanoemulsions. The preparation and applications of curcumin encapsulated nano-emulsions have many challenging key factors like the stability, solubility, polarity, acceptability and activity. The present study is a brief account on the preparation and applications of curcumin nanoemulsions for diverse applications including food, healthcare and personal care.



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Spectroscopic and Thermoacoustical Interaction of Anti-biotic Drug Doxycycline with Biocompatible Transition Metal Ions

A.K.Sahoo¹, S.K.Pradhan², A.K.Patnaik³, S.P.Das^{3*}

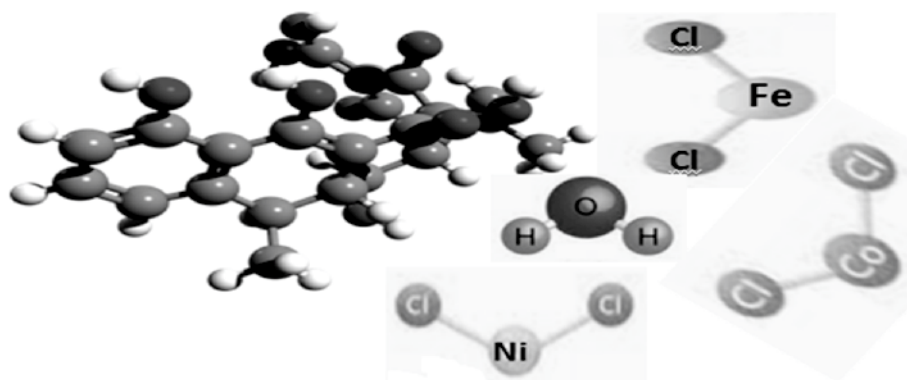
¹Department of Chemistry, Christ College, Cuttack, Odisha-753008, India

²Department of Chemistry, Pattamundai College, Pattamundai, Odisha -754215, India

³Department of Chemistry, Ravenshaw University, Cuttack, Odisha-753003, India

*Corresponding author E-mail: dassmrutiprava@yahoo.in

Doxycycline hyclate (DH) is a non Newtonian, synthetic broad spectrum tetracycline class antibiotic drug made up of four fused rings with multiple therapeutic and pharmaceutical potential. DH is used for the treatment of many bacterial infections, such as urinary tract infections, acne, gonorrhoea, Anthrax, Lyme disease, Plague, *P. falciparum* (malaria) and periodontitis and is an active tetracycline class medicament that shows powerful effect against infections caused by several micro-organisms groups such as *Haemophilus ducreyi*, *Yersinia pestis*, *Legionella*, *Chlamydia*, *Mycoplasma* and *Borrelia*. Density (ρ), speed of sound (u), and viscosity (η) measurements of drug doxycycline with transition metal salts such as FeCl_2 , CoCl_2 , NiCl_2 in aqueous medium were carried out in the concentration range ($0.02\text{--}0.20\text{ mol dm}^{-3}$) at $293.15\text{--}313.15\text{ K}$ with 10 K interval in a multifrequency interferometer. The experimental data has been meticulously evaluated and various parameters such as adiabatic compressibility (β_s), Partial molal volume (ϕ_v), intermolecular free length (L_r), apparent molal compressibility (ϕ_{κ}), specific acoustic impedance (Z), relative association (RA), solvation number (S_n) were calculated. The results were interpreted in terms of different kinds of intermolecular interactions present in the ternary (doxycycline hyclate + water + transition metal ion) system. The drug-metal ion interactions are the key players in ternary system. Thermoacoustical results indicates complex formation between doxycycline hyclate with transition metal ions and the mixture behaves as a structure breaker.



Key words: Doxycycline, intermolecular free length, acoustic impedance, relative association

GREEN CHEMISTRY TO RECYCLE FE/C-RICH WASTES FOR ENVIRONMENTAL POLLUTION CONTROL

Dr. Smruti Pattnaik, Sr. Lecturer

PG Dept. of Chemistry, U.N. Auto College of Sc. & Tech, Adaspur

Massive Fe/C-rich wastes are generated from water treatment, surface finishing, refining and chemical industries. The chemistry in recycling environmental products from the Fe/C-rich wastes has been advanced dramatically during the past decade. New strategies and novel processes have been developed to significantly reduce the production, environmental impacts, and disposal costs of Fe/C-rich wastes. Products from recycling Fe/C-rich wastes using clean production processes have shown great potential in environmental pollution control. Those products have been successfully used as an adsorbent, flocculant, catalyst, precipitant, demulsifying reagent, conditioning reagent, filter material, and membrane in treating waste streams and clean up environmental spills and pollutant releases. Green chemistry has advanced the concept of “waste to waste” through minimizing consumption of freshwater, chemical reagents, and energy in the recycling processes, which can play an important role in the circular economy.

Treating wastes with wastes has become the main direction for recovering resources from Fe/C rich wastes. Recycling the wastes into products for environmental pollution control should focus on advanced chemistry concepts to design reaction routes and optimize reaction conditions for the improvement of productivity and performance stability of the products. Reducing the use of hazardous chemical reagents, production of secondary wastes, and energy consumption should be emphasized as well in wastes recycling to achieve clean production and minimum carbon emission in the recycling processes. Green chemistry has opened up new avenues for recycling of Fe/C-rich wastes into environmental products through cleaner reaction routes and lower energy consumption without generating secondary wastes.

Keywords: Green chemistry, waste, recycling, environmental products, pollution control, clean production.

Assesement of water Quality parameters of Bhitarkanika National Park, Kendrapara, Odisha in 2020 .

**Dr S. K. Pradhan, Dr F. C. Pradhan, Pattamundai College, Pattamundai
Dr S. P. Das, Ravenshaw University, Dr A. K. Patnaik, Ravenshaw University,
A.K. Sahoo, Crist College, Cuttack.**

Mangroves are the tidal forests of coastal wetlands, existing in the intertidal zones of sheltered shores, estuaries, tidal creeks, backwaters, lagoons, marshes and mud-flats of the tropical and sub-tropical regions of the world. The Bhitarkanika mangrove forest is the second largest mangrove forest in India. Mangroves of Bramhani and Baitarani delta of Kendrapara district have been declared as Bhitarkanika Wildlife Sanctuary in April 1975 covering an area of 672 sq km. Bhitarkanika is endowed with very complex sub-ecosystem of freshwater, marine and terrestrial, which is intricately mixed with each other. Mangrove swamps are one of the richest and most productive areas, which form the base of the food chains in sea and coastal waters.

The mangroves play a significant role in protecting the hinterland against cyclones and the ingress of seawater during tidal surge. Mangroves stabilize coastal landmass against sea erosion.

Mangrove forests act as a buffer against any natural disasters. This study assesses the physico-chemical integrity of lotic ecosystems of Bhitarkanika National park through field investigations and multivariate analysis during the COVID pandemic period. The present study is the first comprehensive investigation to assess the water quality, determine the suitability of water for aquatic life in the wetland; and its sustainability for irrigation, existence of wild life, ecosystem in and around the wetland. Fourty samples of water from Bhitarkanika wetland were analyzed and spatial variations of dissolved oxygen (DO), dissolved phosphate, nitrate, and biological oxygen demand (BOD₅), Chemical oxygen demand (COD) were determined. The concentration of DO was higher in areas with shallow depth and rich growth of submerged vegetation compared to deeper areas with no vegetation. A significant degradation in the WQ of the stations located in the lower reaches of the river basin is observed. Dhamara is the most polluted point followed by Dangamala and Chandabali. The most inferior WQ with OIP value of 3.95 is observed in the premonsoon season of 2020 at Dhamara area. The OIP based on the individual index values was estimated giving the values in terms of pollution indices. For the analysis, five sampling sites were selected with triplicate analysis of collected water sample were done to represent the effective impact of river man made on selected physicochemical parameters. Physicochemical parameters such as water temperature, pH, dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), phosphates (PO₄²⁻), nitrates (NO₃⁻), electrical conductivity (EC) chlorides (Cl⁻), fluoride (F⁻). Also, the Water Quality Index (WQI) for the water samples collected from the selected points of the Brahmani River was calculated in order to assess its suitability for drinking, irrigation and agricultural purposes. It was affirmed that the origin of boron is mainly attributed to seawater influx, that of fluoride to anthropogenic sources, and other parameters originated through geographical processes as well as human activities, runoff from agricultural fields, and wastewater from adjoining villages, respectively. Values of heavy metal pollution index (HPI), heavy metal evaluation index (HEI), and degree of contamination (Cd) in water confirmed high level of metal contamination of the medium. Based on the water quality index (WQI), the water was partly unsuitable for aquatic life and use in agricultural utilization. The fluoride content is however well within limit. It can be concluded that water quality of Bhitarkanika wetland was adversely affected by heavy metals, which is a cause of concern since this wetland is a temporary resort of migratory birds. Immediate intervention is required to improve the water quality, especially scrutiny and inspection of the added waste water from surrounding villages, and runoff from adjoining agricultural fields & industrial cities along the river. Key Words:- dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), Water Quality Index (WQI), Overall index of pollutant (OIP)

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KNOW YOUR TOOTHPASTE

Dr. SupravaParida, Reader in Chemistry

Subhadra Mahatab Mahavidyalaya, Asureswar, Cuttack, Odisha

Email- supravakishoreswain@gmail.com

A toothpaste is defined as a semi-solid material used for removing naturally occurring deposits from tooth (oral cavity) and improve oral health & aesthetics. The history of use of toothpaste/powder for oral hygiene dates back to 5000BC. The world's oldest known formula for tooth paste was created by the Egyptians. They crushed rock salt, mint, dried Irish flower, pepper and mixed them together to create a powder to clean their teeth. Thereafter a number of formulations for tooth pastes are prepared and marketed based on the age groups, dental complications, removing dental plaque, stains etc. The main constituents of toothpaste used now a days are abrasives, binders, humectants, coloring agents, foaming agents, flavoring agents, sweeteners, anti caries agents, whitening agents, anti-halitosis agents too. The basic ingredients used in toothpaste are having selected (standard) composition with remineralising agents and higher amount of abrasives that are capable of removing or preventing the deposition of stains on tooth's surface.

Hydrated silica is an abrasive ingredient used in toothpaste to provide a dental office, like clean feeling, but for some people it can be too harsh. Whitening toothpaste which contain hydrated silica are easily obtained over the counter by consumers. Tooth brushing with these toothpastes for a prolonged time increases enamel roughness and decreases enamel micro hardness, which in turn increases the potential of caries risk.

Therefore, it is required to determine the silica (SiO_2 , H_2O) in tooth pastes, in order to find if more than the specified amount is added. Silicon being an inorganic analyte, it's determination is possible by Atomic Absorption Spectrometry (AAS) or Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES). These two spectrometric based instruments require the sample in liquid form to be aspirated into the atomizer. Additionally, these spectrometric instruments can't tolerate high level of matrix of the tooth paste. So, the tooth pastes samples require mineralisation, i.e. conversion of the organic matrix into carbon dioxide and water using nitric acid as oxidant in the presence of sulfuric acid over a hot plate. This method is time consuming and requires more amount of acids. To surmount this problem, alternatively, microwave digestion inside sealed Teflon pressure vessels can be used. Both these types of digestion approach provide clear water like solution of the tooth pastes, which can be used for the quantification of silica using a silicon standard solution as calibrant. Different brands of tooth pastes (normal and herbal types) could be analyzed for the silicon content for a comparison. Dental medical scientists can use the data obtained from such analysis to correlate enamel decay with silica content of tooth pastes.

Keywords :- Abrasive, Hydrated silica, AAS, ICP-AES, Teflon

Carbohydrate Mediated Size-Selective Green Synthesis of Silver Nanoparticles

Ritisnigdha Mishra,^a Chinmayee Pattnaik,^a Laxmi Narayan Sahoo,^b and Satyanarayan Sahoo^a

P. G. Department of Chemistry, Berhampur University, Bhanja Bihar, Odisha, 760007

^bDepartment of Chemistry, Government Science College Chatrapur, Odisha, 761020

E-mail: sns.chem@buodisha.edu.in

In recent times, silver nanoparticles (AgNPs) have attracted considerable attention due to their wide range of potential application in biomedical application, textile industry, food packaging, cosmetic industry, clean water technology, energy generation and information storage. The conventional methods for synthesis of AgNPs require hazardous chemicals as reducing agents and large quantities of external energy (heat). But, green synthesis of silver nanoparticles is considered as one of the promising eco-friendly approach due to biocompatibility and low toxicity. Recently, various parts of plants such as root, flowers, leaves and fruit have been used for the green synthesis of silver nanoparticles. But these methods are not competent to synthesize silver nanoparticles with desirable size, shape morphology and stability. In literature, there are limited number of reports on synthesis stable metal nanoparticles with controlled size and shape. The present approach is a combination of both the concepts involving green synthesis of AgNPs using *Ocimum Sanctum* (Tulsi) leaf extract as green reducing agent and use of monosaccharides as capping agent to achieve desirable size and stability. The synthesized AgNPs with different size and shape possess excellent optical properties and anti-microbial activities.

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Multivalent Aromatic Glycopeptoids as low Molecular Hydrogels

Satyanarayan Choudhury,^a Chinmayee Pattnaik,^a Laxmi Narayan Sahoo,^b and Satyanarayan Sahoo^a

^aP. G. Department of Chemistry, Berhampur University, Odisha, 760007

^bDepartment of Chemistry, Government Science College Chatrapur, Odisha, 761020

E-mail: sns.chem@buodisha.edu.in

Hydrogels are cross-linked network of molecules produced by the simple interaction of one or more small or polymeric structures in a solvent or mixture of solvents, one of which is preferably water. Such molecular frameworks are held together by weak molecular forces like hydrophilic or pi-pi stacking interaction or vander Waal's interaction. Recently, hydrogels have received significant attention, due to their wide range of applications in various fields. Glycoconjugates functionalized with structurally diversified aromatic rings, can act as hydrogels due to their amphiphilic character. In this present work, a series of

aromatic ring containing functionalized alkyne were conjugated to suitably protected glycosyl azides by [3 + 2] cycloaddition reactions. The gelation property of these glycoconjugates were examined in various solvents. The hydrogels were characterized using various analytical techniques.

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Photocatalytic Applications of Graphene CeO₂-TiO₂ Nano Composites

Muralilal Barik¹, Debasmita Sahoo², Akshya Kumar Sahoo³, Debasish Das¹,
PremRanjan Rauta⁴, Pramod Kumar Satapathy^{1*} and Priyabrat Mohapatra^{2*}

1: Department of Chemistry, Maharaja Sriram Chandra BhanjaDeo University, Baripada, 757003

2: Department of Chemistry, C.V. Raman Global University, Bhubaneswar 752 054

3: Department of Chemistry, Model Degree College, Khariar 766107, Odisha, India

4: Dalmia Institute of Scientific and Industrial Research, Rajgangpur, Sundergarh 770017

*Corresponding Author(s)-pramoda_satapathy_70@yahoo.com and priyabratm@gmail.com

Abstract

Modified TiO₂-CeO₂ based mixed oxides have attracted much interest for different catalytic applications because of their improved properties. Graphene is a zero-band gap semiconductor having plate like structure. Graphene possesses very unique electronic and mechanical properties. The delocalized pi electrons are also responsible for various interactions between graphene layers and substrate. Graphene can be coupled with metals, oxides to form nano composites. Due to presence of huge amount of oxygen-containing functionalities at the surface of graphene oxide provides sufficient reactive sites for chemical modification. Graphene with its 2D planar structure has unique performance characteristics such as high surface area, high electron mobility and high conductivity. As a result, the charge transfer through metal-oxide-graphene interface results in synergistic effect boosting the performance of composite significantly.

Graphene was synthesized from Graphite by modified Hummers method. A series of CeO₂-TiO₂ mixed oxide was prepared by varying the CeO₂ content, by Co-precipitation method. Finally Graphene CeO₂-TiO₂ nano composites were prepared by chemical reduction method. The composites were characterized by XRD, FTIR, BET Surface Area, UV-Visible DRS etc. The Catalytic activity of the composites was studied for photo-decolorization of methylene blue. During the photodegradation the parameters such as CeO₂ content, graphene content, concentration of dye, time of reaction etc. Among the different photocatalyst studied the sample containing 2wt% CeO₂ in the composite shows best activity.

Isolation And Characterization of Novel Thermophilic Bacterial Consortium For Bioethanol Production from Rice Straw

Pradip Kumar Jena*, Mahendra Kumar Mohanty and Santosh Kumar Mohanta
Odisha University of Agriculture and Technology, Bhubaneswar,751003

Abstract

In the recent past, a lot of emphasis has been placed all over the world on bio-energy as a possible long term and sustainable alternative to fossil fuel based energy. Biomass is a key renewable energy resource that includes plant and animal material, such as wood from forests, material left over from agricultural and forestry practices, and organic industrial, human and animal wastes. It is composed of carbohydrate polymers (cellulose, hemicellulose) and an aromatic polymer (lignin). These carbohydrate polymers contain different sugar monomers (six and five carbon sugars) and they are tightly bound to lignin.

Isolation and characterization of thermophilic CBP micro-organisms was done from the water and soil samples collected from Taptapani and Atri hot water spring, Odisha through serial dilution and agar plating techniques. From the observations it was observed that bioethanol can be produced from lignocellulosic biomass of *Pennisetum* species; *Pennisetum purpureum* and *Pennisetum pedicellatum* using simultaneous hydrolysis and fermentation approach from the co culture of thermophilic bacteria; *Bacillus anthracis* and *Bacillus subtilis* collected from Taptapani and Atri, a perennial hot spring successfully at its optimum growth conditions of pH 7 and incubation temperature of 60°C. This information may be further used to carry out research work in optimization of bioethanol production from lignocellulosic biomass.

*Corresponding author : pradip_callme@yahoo.co.in

Synthesis and Photophysical Study of Hetero-polycyclic and Carbazole Motif: Nickel-Catalyzed Chelate Assisted Cascade C-H Activations/Annulations



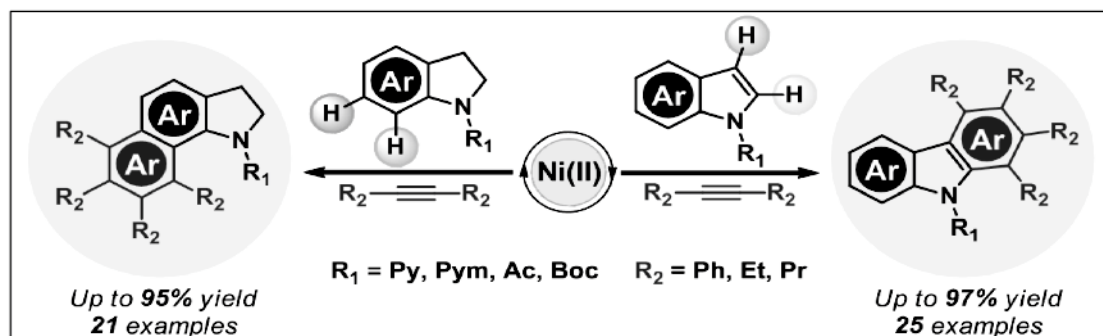
Namrata Prusty,

Shyam Kumar Banjare, Smruti Ranjan Mohanty, Tanmayee Nanda, Komal Yadav, and Ponneri C. Ravikumar*

Author Address : School of Chemical Sciences, National Institute of Science Education and Research (NISER), HBNI, Bhubaneswar, Odisha 752050, India.
Email: pcr@niser.ac.in

Abstract

Catalytic C-H functionalization (activation) offers the promise of atom economical introduction of functionality into organic molecules by direct transformation of C-H bonds to C-C, C-N, or C-O bonds. Compared to more traditional approaches that involve functional group manipulations, the direct utilization of C-H bonds in synthesis can minimize chemical steps, cost, and environmental impact.¹⁻³ In this context, the use of 1st row transition metal catalyst has received much more attention as compared to 2nd & 3rd row transition metal atom because of their low cost, unique reactivity profiles, and easy availability.⁴ Among these metals, nickel (Ni) catalysts have drawn considerable attention from the scientific community.⁵ Moreover, nickel is capable of existing in various oxidation states, such as Ni(0)-Ni(IV), which provides different redox pathways during reactions. This propensity of nickel enables catalytic reactions that are mechanistically distinct from those for other metals. Herein, we have discussed, nickel catalyzed synthesis of bioactive heteropolycyclic and carbazole molecule through sequential C-H bond activations. We have also studied the photophysical properties of these highly conjugated molecules.



Keywords: Nickel catalyst, cascade C-H bond activation, photophysical study of polyheterocyclic molecule.

Figure. 1: Schematic representation for nickel catalyzed double C-H bond activation of indoles and indolines.

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MESOPOROUS CoMCM-48 AS CATALYST FOR OXIDATION OF LIGNIN MODEL NON-PHENOLIC MONOMER

N. Parida, S.K. Badamali*

Kendrapara Autonomous College, Kendrapara, Odisha

Department of Chemistry, Utkal University, Vani Vihar, Bhubaneswar, Odisha

*Email: skbadamali@gmail.com

Over the last two decades mesoporous molecular sieves, in particular the M41S family [1] with high surface area, tuneable pore size, and large pore volume have gained increased attention as heterogenous catalyst or catalyst support material. Several studies on the incorporation of hetero-atoms such as Cr, Al, Fe, V, Ti and Ga in the framework of silicious mesoporous materials by direct synthesis or post-synthesis grafting methods have been reported in literature [2]. The recent applications of cobalt based catalysts for the oxidation of lignin or lignin model compounds have opened up a new avenue to explore larger application in biomass utilization [3]. In this report we have focused chiefly on lignin, as a source of chemicals with special reference to Veratryl alcohol, its oxidation behavior will be studied over Cobalt containing mesoporous (CoMCM-48) catalyst under mild reaction condition. Veratryl alcohol (3, 4-dimethoxybenzyl alcohol) is one of the most commonly studied non-phenolic molecules, being investigated in order to understand the greater application.

Veratryl alcohol has a vast use in chemical industry for preparation of many pharmaceutical products, and also in the manufacture of fragrance agents. Oxidation of veratryl alcohol produces veratraldehyde which is widely used as a flavorant and odorant. Commonly oxidation of veratryl alcohol has been studied in homogeneous medium catalysed by metal complexes [4] to produce veratryldehyde. However, these processes possess the catalyst as major challenge. Heterogenous catalysis offers selectivity, recovery and reusability of the catalyst which cannot be realized in the homogenous catalysis. In the present proposal we intend to develop cobalt based heterogeneous mesoporous MCM-48 catalyst which can be studied towards the oxidation of veratryl alcohol under mild conditions to produce veratryldehyde or veratric acid.

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Synthesis of Metal Organic Framework derived Manganese Oxide/Carbon Nano composites from Low Grade Manganese Ores

Arpeeta Hota^{1,2}, Prasanna Kumar Panda^{1,2}, Avijit Biswal³, Bankim Chandra Tripathy^{*1,2}

¹Academy of Scientific and Innovative Research, CSIR-HRDC Campus, Ghaziabad 201002

²CSIR-Institute of Minerals and Materials Technology, Bhubaneswar 751013, India

³Odisha University of Technology and Research, Bhubaneswar 751029, India

Abstract

The comprehensive utilization of low-grade ores has received much attention from economic and environmental perspectives due to the shortage of high-grade Manganese ore resources. In this context, an attempt has been made to develop a process to utilize low-grade manganese ores as a source of manganese (Mn^{2+}) ions for synthesizing high valued energy storage materials. For this purpose, extracted Manganese ions from low grade ore is first transformed into manganese based metal organic framework (MOF) which is then transformed into manganese oxide/carbon nano material.

Metal organic frameworks (MOFs) are a class of compounds consisting of metal ions or clusters coordinated to organic ligands to form 1D, 2D, or 3D networks. They are a subclass of coordination polymers that emerged rapidly in the last few years due to its higher porosity, larger specific surface areas, multiformity of structures and functions. Besides being used directly Mn-MOFs can be also used as a precursor for the synthesis of various porous active structures, such as MnO_x or MnO_x/C which are potentially attractive for energy storage materials.

Selective leaching of manganese is adopted to recover most of the manganese from its low grade ore. The extra pure manganese salts can be prepared from leach liquor by using various methods such as reagent addition or pH manipulation. Thereafter Mn-MOFs (e.g., Mn-MOF-71, Mn-MIL-100, Mn-BTC) are synthesized through different economically favourable methods.

It is feasible to transform the synthesized Mn-MOFs into MnO_x/C nano material by calcination in an inert atmosphere. Here selection of appropriate MOF precursor is essential, as the product inherits the morphology of the parent MOF to some extent. This innovative approach opens up a new paradigm for converting the low grade ores into high-value end product with lesser recycling burden.

Zinc Hydride Catalyzed Chemoselective Hydroboration of Isocyanates: Amide Bond Formation and C=O Bond Cleavage

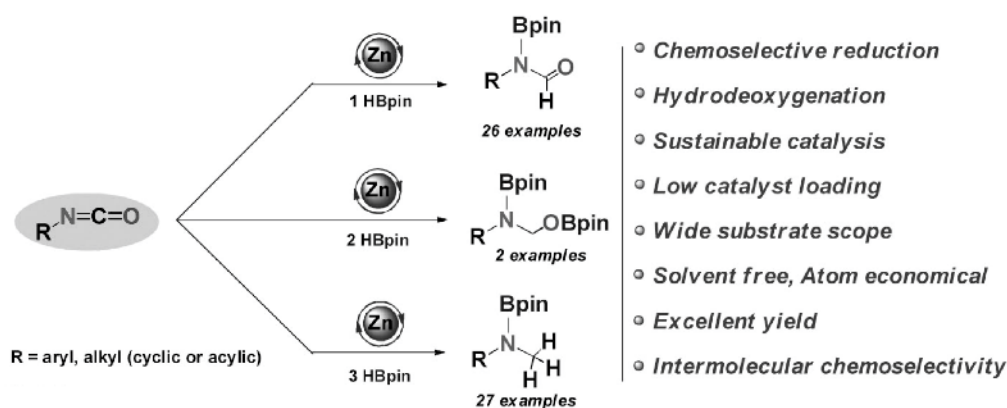
R. K. Sahoo, N. Sarkar, and S. Nembenna*

National Institute of Science Education and Research (NISER), Bhubaneswar, HBNI, 752 050, India

Email: rajata.sahoo@niser.ac.in

ABSTRACT

An unprecedented molecular bridged zinc hydride, [$\{LZnH\}_2$; L = $\{(ArHN)(ArN)-C=N-C=(NAr)(NHAr)$; Ar = 2,6-Et₂-C₆H₃}] (**I**) catalyzed mono hydroboration (partial reduction) of isocyanates into corresponding N-boryl formamides for the first time.^[1] A broad range of alkyl and aryl isocyanates undergo chemoselective reduction with HBpin to obtain selectively N-boryl amide, bis(boryl) hemiaminal, and N-boryl methyl amine products.^[2,3] Isocyanates undergo a deoxygenation reduction reaction via hydroboration, in which the C=O bond cleaves, forming N-boryl methylamines.^[4,5] More interestingly, this catalyst covers intra and intermolecular chemoselective hydroboration of isocyanates over other several reducible functionalities like cyano, halide, nitro, and alkene groups. Moreover, a series of control experiments, structurally characterized intermediates, and kinetics suggest that the CBG zinc hydride complex is responsible for all reduction steps.



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Organocatalytic Asymmetric Synthesis of Spirooxindole Embedded Oxazolidines

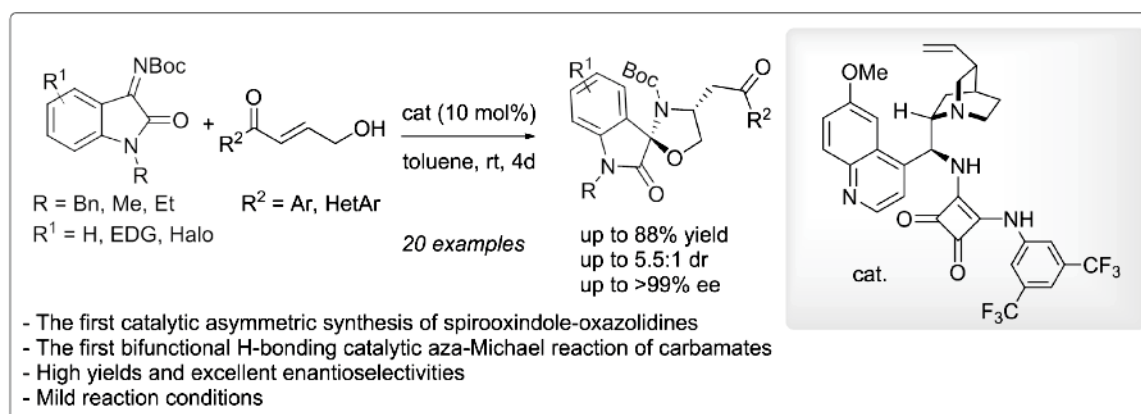
Chandrakanta Parida and Subhas Chandra Pan*

Author Address : Department of Chemistry, Indian Institute of Technology Guwahati,
North Guwahati, Assam, 781039, Email:span@iitg.ac.in

Abstract

Chiral oxazolidine is an essential structural framework widely present in many biologically active natural products and pharmaceuticals. The first organocatalytic asymmetric synthesis of spirooxindole embedded oxazolidines has been developed via a domino reaction involving hemiaminal formation followed by an unprecedented *aza*-Michael reaction between isatin derived *N*-Boc ketimines and γ -hydroxy enones. Quinine derived bifunctional squaramide catalyst was found to be efficient for this reaction and the products were obtained in good diastereo- and with high enantioselectivities.

Keywords : Organocatalysis, Chiral Oxazolidone, Spiro-oxiindole



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Ruthenium (VIII) Catalysed Dearomative Pyridyl C-X Activation - Direct Synthesis of *N*- Alkyl-2-pyridones.

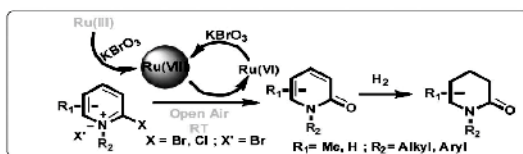
Biswajit Das, Nilendri Rout and Debayan Sarkar*

Organic Synthesis and Molecular Engineering Laboratory,

Department of Chemistry, National Institute of Technology, Rourkela, Odisha 769008, India.

E-mail ID: sarkard@nitrkl.ac.in

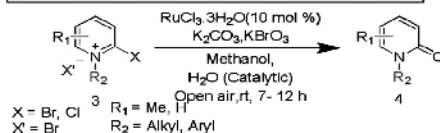
An efficient synthetic strategy employing pyridyl C-X activation, for the generation of *N*-alkyl-2-pyridones from *N*-alkyl-2-halopyridinium salts is described.



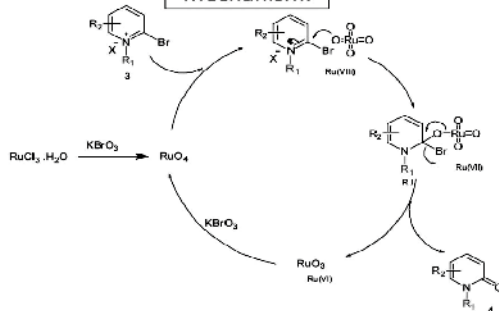
Transition metal catalysed dearomatization reactions have emerged as an efficient method for the step-economic synthesis and modification of a wide range of important carbocycles and heterocycles.¹ Dearomatization of pyridines, opens their functionality towards a wide area of naturally and biologically potent compounds. Pyridones, being dearomatized synthetic derivatives of pyridines. Thus, the pyridyl C-X activation opens up the possibility of interesting site-selective transformations. Ru complexes have proven their diverse catalytic efficacy over a broad spectrum of organic synthetic reactions, including dearomatization,² C-H activation³ and cycloaddition⁴ reactions. Among other oxidation states of Ru, Ru(VIII) catalysts have also shown impressive catalysis, but still remains unexplored.

Herein, we report a direct and effective method for one step synthesis of 2- pyridones via oxidative dearomatization of 2- halo *N*-substituted pyridinium salts. It significantly provides an option for desired substitution at the *N*-atom via salt preparation. The present demonstration of the dearomatization of pyridine salts is based on our earlier work showing intramolecular oxo-etherification and spiro-annulation of naphthols and phenols employing $\text{RuCl}_3 \cdot 3\text{H}_2\text{O}$ as catalyst in the presence of ethical-oxidant KBrO_3 .⁵

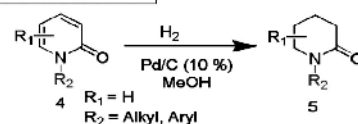
General Representation:



Mechanism:



Application:



References:

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$K_2S_2O_8$ -mediated Synthesis of Highly Functionalized Pyrroles Via Oxidative Self-dimerization of *N*-Propargylamines



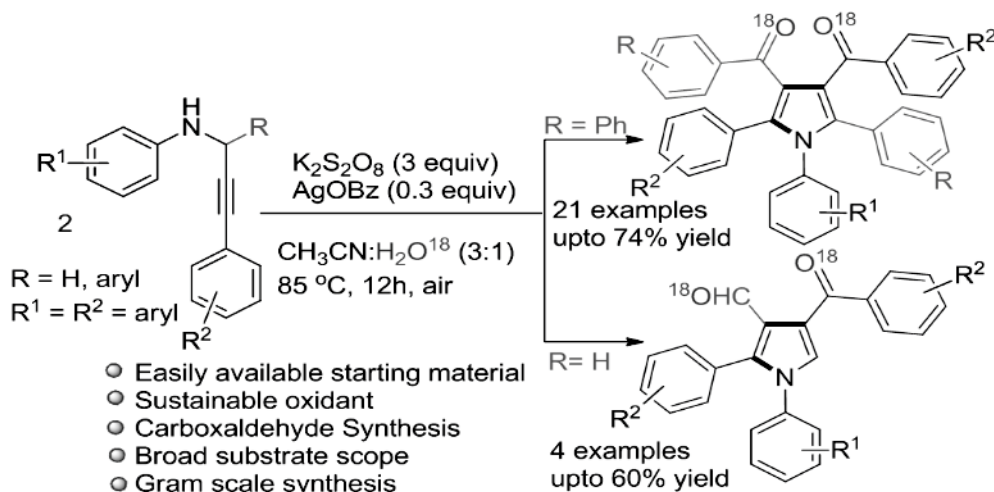
Bipin Kumar Behera, Anil K. Saikia*

Author Address: Department of Chemistry, Indian Institute of Technology Guwahati,
North Guwahati, Assam, 781039, Email: bipin176122014@iitg.ac.in

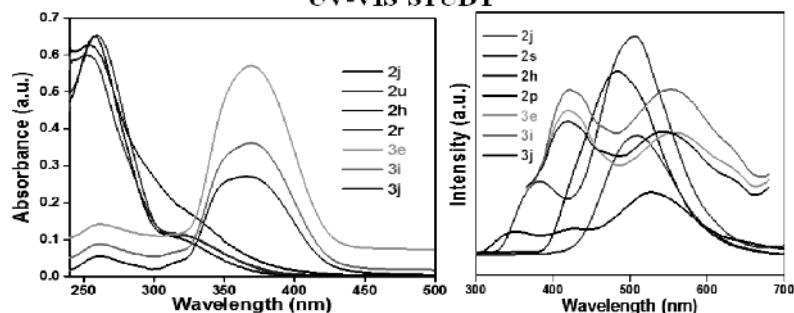
Abstract

An efficient methodology is reported for the synthesis of both tetra- and penta-substituted pyrroles *via* oxidative self-dimerization of *N*-propargylamines, catalyzed by silver benzoate in presence of $K_2S_2O_8$. The protocol provides a simple route for the synthesis of both tetra- and penta-substituted pyrroles with two carbonyl groups in the side chain. The methodology can be extended towards the synthesis of pyrrolo[3,4-*d*]pyridazine and fluorescence properties has been studied for some selected compounds.

Keywords: pyrroles, radical cyclization and fluorescence.



UV-VIS STUDY



References:

1. Behera, B. K.; Sahu, A. K.; Ngangbam, R; Saikia, A. K. *J. Org. Chem.* **2021**, *86*, 12481.

Acknowledgements : This work was supported by MHRD. We also thank CIF, Indian Institute of Technology Guwahati for the instrumental facility.

APPLICATIONS OF POLYAROMATIC - METAL / METAL OXIDE COMPOSITES

Asit Parija

Department of Chemistry, Salipur Autonomous College, Salipur. Cuttack. Odisha.

asitparija2k8@yahoo.com

Abstract:

Polymers have always been considered as insulators of electricity. No one would have believed 40 years ago that polymers could conduct as good as metals. This is possible only by simple modification of ordinary organic conjugated polymers. They are called electrically conducting polymers or as synthetic metals. They combine the electrical properties of metals with the light weight, greater workability and resistance to corrosion of polymers. They are used in our day to day life with a wide range of products like applications in space, aeronautics, electronics etc.

Polypyrrole is one of the modern generations of polymeric materials which can be used as compact capacitors, antistatic coating, electromagnetic shielding and smart windows, capable to vary the amount of light to pass. It is mainly used due to its advantage as environmentally stable, easy to synthesise and high conductivity. Nanocomposites have attracted wide attention because of their potential to combine desirable properties of different nanoparticles to improve mechanical, optical, electronic, or magnetic properties.¹⁻⁶ There has been a growing interest in incorporating functional components, such as functional groups, polymers and nanoparticles, into the self assembled nanostructures, however, success has been limited to two phase organic/inorganic hybrid materials, nanoparticles or polymer-based nanocomposites.^{4,5,7,8} Polymer nanocomposites containing surface engineered metaloxide, or, silica, nanocomposites continuously offer new opportunities to enhance desired properties or, functionalities, such as optical transparency, ductility, flexibility or molecular mobility.⁹⁻¹³

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Assesement of water Quality Parameters of Bhitarakanika National Park, Kendrapara, Odisha in 2020

Dr S.K.Pradhan, Dr F.C.Pradhan, Pattamundai College, Pattamundai,

Dr S.P.Das, Dr A.K.Patnaik, Ravenshaw University, A.K.Sahoo, Crist College, Cuttack.

Mangroves are the tidal forests of coastal wetlands, existing in the intertidal zones of sheltered shores, estuaries, tidal creeks, backwaters, lagoons, marshes and mud-flats of the tropical and sub-tropical regions of the world. The Bhitarakanika mangrove forest is the second largest mangrove forest in India. Mangroves of Bramhani and Baitarani delta of Kendrapara district have been declared as Bhitarakanika Wildlife Sanctuary in April 1975 covering an area of 672 sq km. Bhitarakanika is endowed with very complex sub-ecosystem of freshwater, marine and terrestrial, which is intricately mixed with each other. Mangrove swamps are one of the richest and most productive areas, which form the base of the food chains in sea and coastal waters. The mangroves play a significant role in protecting the hinterland against cyclones and the ingress of seawater during tidal surge. Mangroves stabilize coastal landmass against sea erosion. Mangrove forests act as a buffer against any natural disasters.

This study assesses the physico-chemical integrity of lotic ecosystems of Bhitarakanika National park through field investigations and multivariate analysis during the COVID pandemic period. The present study is the first comprehensive investigation to assess the water quality, determine the suitability of water for aquatic life in the wetland; and its sustainability for irrigation, existence of wild life, ecosystem in and around the wetland. Forty samples of water from Bhitarakanika wetland were analyzed and spatial variations of dissolved oxygen (DO), dissolved phosphate, nitrate, and biological oxygen demand (BOD_5), Chemical oxygen demand (COD) were determined. The concentration of DO was higher in areas with shallow depth and rich growth of submerged vegetation compared to deeper areas with no vegetation. A significant degradation in the WQ of the stations located in the lower reaches of the river basin is observed. Dhamara is the most polluted point followed by Dangamala and Chandabali. The most inferior WQ with OIP value of 3.95 is observed in the premonsoon season of 2020 at Dhamara area. The OIP based on the individual index values was estimated giving the values in terms of pollution indices. For the analysis, five sampling sites were selected with triplicate analysis of collected water sample were done to represent the effective impact of river man made on selected physicochemical parameters. Physicochemical parameters such as water temperature, pH, dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), phosphates (PO_4^{2-}), nitrates (NO_3^-), electrical conductivity (EC) chlorides (Cl^-), fluoride (F). Also, the Water Quality Index (WQI) for the water samples collected from the selected points of the Brahmani River was calculated in order to assess its suitability for drinking, irrigation and agricultural purposes. It was affirmed that the origin of boron is mainly attributed to seawater influx, that of fluoride to anthropogenic

sources, and other parameters originated through geographical processes as well as human activities, runoff from agricultural fields, and wastewater from adjoining villages, respectively. Values of heavy metal pollution index (HPI), heavy metal evaluation index (HEI), and degree of contamination (Cd) in water confirmed high level of metal contamination of the medium. Based on the water quality index (WQI), the water was partly unsuitable for aquatic life and use in agricultural utilization. The fluoride content is however well within limit. It can be concluded that water quality of Bhitarkanika wetland was adversely affected by heavy metals, which is a cause of concern since this wetland is a temporary resort of migratory birds. Immediate intervention is required to improve the water quality, especially scrutiny and inspection of the added waste water from surrounding villages, and runoff from adjoining agricultural fields & industrial cities along the river.

Key Words :- Dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), Water Quality Index (WQI), Overall index of pollutant (OIP)

Reference :-

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Morphologically Varying Cubical and Quasi-spherical ZnO @Metal Oxides Nanocomposites on GO Surface and its study on Dielectric Behaviour

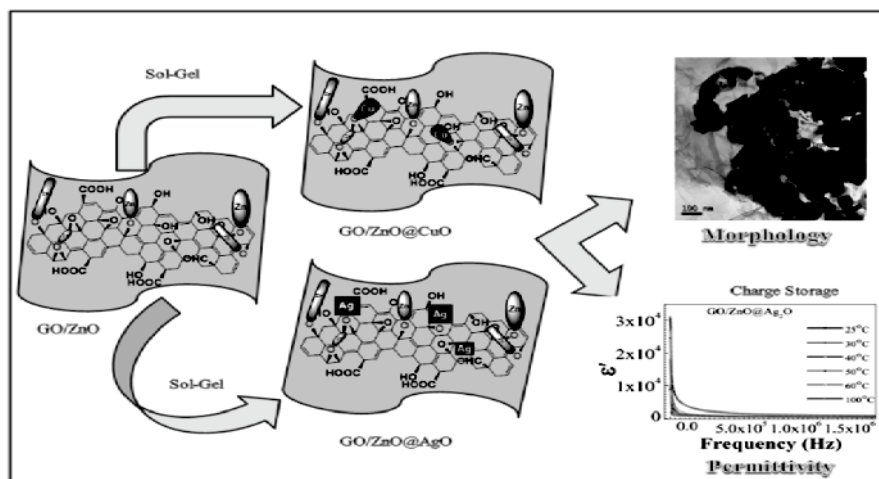
Debasrita Bharatiya^{a#}, Biswajit Parhi^{a#}, Sarat K Swain^{*a}

^a Department of Chemistry, Veer Surendra Sai University of Technology, Burla, Sambalpur, 768018, Odisha, India

Author E-mail : debasritabharatiya@gmail.com

Abstract :

Nanotechnology plays an important role in developing sustainable technologies for the future, humanity and the environment. It provides promising solutions for challenging issues in medicine, science, engineering and technology. In the current time, lots of efforts are made to design the charge storage materials to avoid power supply limitations. Noble GO-based metal oxide nanocomposites have drawn considerable attention in the field of nanoscience and technology, because of their promising wide range of applications in sensors, optoelectronics, bio-photonics, dielectric device, charge storage devices etc [1,2]. The present work reports the significant dielectric permittivity and electronic properties of GO-based ZnO, CuO and Ag₂O mixed ternary nanostructured composite. The morphology of the designed hybrid nanocomposites has a major effect on the enhanced dielectric properties. The synthesized material is designed by using a modified sol-gel route and studied by sophisticated instruments such as TEM, FESEM, FTIR, XRD, Zeta and BET. The permittivity constant, loss and σ_{ac} conductivities (at 200°C) for GO/ZnO@Ag₂O are found to be $5 \times 10^2 - 3.1 \times 10^4$, ≤ 4 and 1×10^{-3} S/m and 1.2×10^{-2} S/m respectively at all ranges of given frequency and temperature. The possibilities of improved charge storage properties are due to the presence of more oxygen moieties, dipolar formation, interfacial polarization and atomic arrangements. Similarly, the highest permittivity (60°C) and σ_{ac} conductivities (at 200°C) of GO/ZnO@CuO are observed to be 2.6×10^3 and 2.25×10^{-4} S/m at 1 kHz respectively. This value is found to be dependent on frequency and increases linearly with the increase in frequency. The specific surface area of such composites is found to be better than free GO/ZnO composites, with a moderate average porosity value and also partially participated for the dielectric property growth. The designed nanocomposites can be used for charge storage uses.



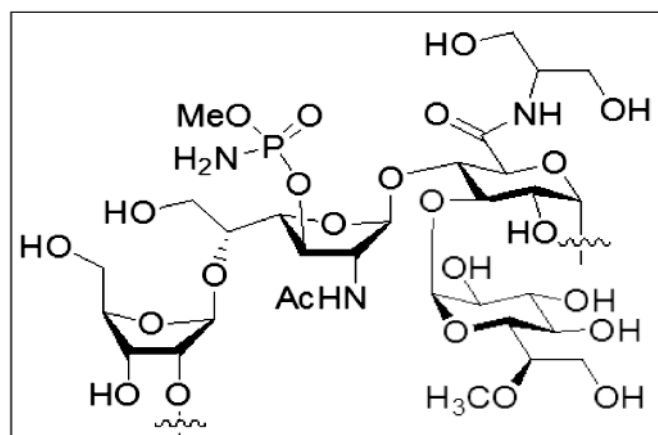
Keywords : Dielectric; Cubical; Quasi-spherical; Improved; Nanocomposites

References:

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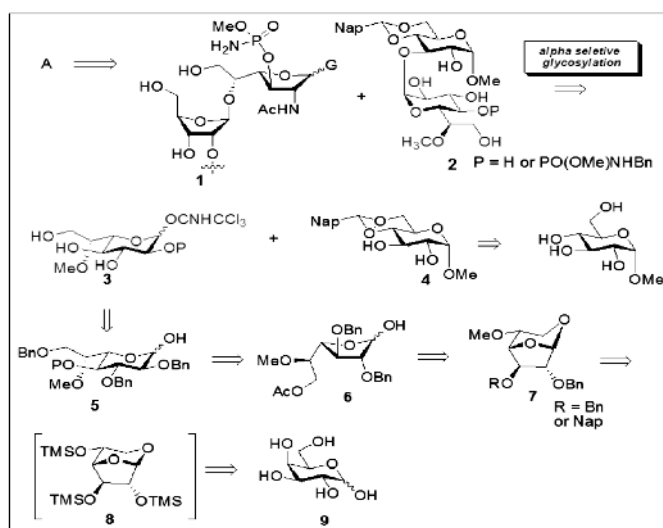
In continuation of our work on the applications to the 1,6-anhydrosugars, we have focused our attention on *C. jejuni* NCTC 11168 with a CPS composed of a tetrasaccharide repeating unit (Figure 3). This tetrasaccharide contains a number of unusual motifs, including an *N*-acetylgalactosamine residue in a furanose form, a glucuronic acid amidated with 2-aminoglycerol, a methyl phosphoramidate moiety and a 6-*O*-methyl-heptose residue in a D-glycero-L-gluco configuration.

Figure 3 : Structure of the tetrasaccharide repeating unit from *C jejuni* NCTC 11168



A synthetic scheme for the tetrasaccharide repeating moiety present in the capsular polysaccharide from *Campylobacter jejuni* NCTC 11168 is designed. The retrosynthesis of the Glycosyl trichloroacetimidate of heptose **1** (Scheme 1) reveals that it can be synthesized from **2**, which in turn can be prepared from a galactofuranose derivative **3**. Compound **3** is planned to be obtained after the ring opening of a 1,6-anhydrogalactofuranose derivative **4**, which can be efficiently prepared via 1,6-anhydrogalactofuranose **5** from D-galactose (**6**) in a single step

Scheme 1 : Retrosynthesis :



ABSTRACT

Name : Dr. GIRIJA PRASAD MISHRA

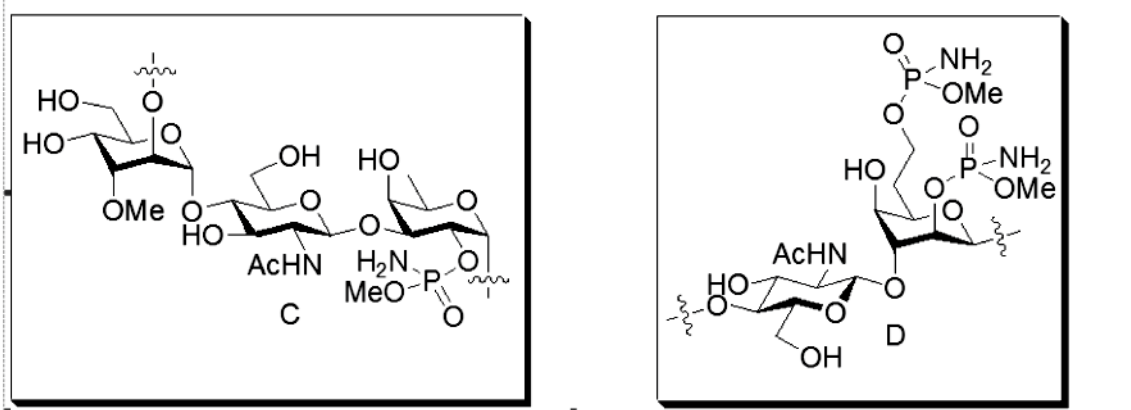
Present Address : Lecturer in Chemistry, Kendrapara Auto. College, Kendrapara, Odisha

Phone No : 9439260849, Email: bmgirija@gmail.com

Concise synthesis of 6-*O*-methyl-D-glycero-*R*-L-gluco-heptopyranose and total synthesis of tetrasaccharide repeating unit from *C. jejuni* NCTC 111168

Campylobacter jejuni (*C. jejuni*) is a food-borne bacterial pathogen that causes bacterial gastroenteritis worldwide. The outer surface of this Gram-negative bacterium is functionalized with various capsular polysaccharides (CPSs), which are responsible for its virulence. The *O*-methyl phosphoramidate (MeOPN) moiety is commonly found as a modification in these CPSs (Fig. 1 and Fig 2). However, the role of this O-MeOPN group is not clearly understood; though several reports have postulated that it is crucial for pathogenicity and serum resistance. While the diphenyl phosphate group can be directly introduced into carbohydrates by using various P (V) phosphorylating agents, such as phosphoryl chloride, incorporation of the MeOPN group cannot be achieved in one step due to the poor electrophilicity of the corresponding P (V) agent. Currently, MeOPN is installed in two steps through a reaction with methyl pivolyl H-phosphonate, a P (III) phosphorylating agent, followed by Atherton–Todd oxidation. This two-step protocol shows low diastereoselectivity and is not compatible with amide, a functional group often found in biologically potent carbohydrate molecules, and azide, which is an important amine protecting group in the synthesis of glycoconjugates. Its regioselectivity is not investigated. In addition, to facilitate the synthesis of MeOPN-containing glycoconjugates and to understand their biochemistry, there is a need for more efficient methods to directly install MeOPN into carbohydrates, preferably in a highly diastereoselective manner.

Figure 1: repeating unit of CPS from *C. jejuni* 81-176 Figure 2: repeating unit of CPS from *C. jejuni* CG8486



Green Synthesis of Guar gum-g-P (MMA-co-AM)/ MMT Nanocomposites Superabsorbent

Author :- Dr. Pramilarani Behera, Reader in Chemistry
Tulasi Women's College, Kendrapara

Guar gum grafted copolymer GG-g-P (MMA-co-AM) and GG-g-P(MMA-co-AM)/MMT Nanocomposites Super absorbent can be synthesised by using two monomers such as MMA(hydrophobic), AM(hydrophilic) and nano clay as MMT in presence of Co(III) complex via emulsifier free emulsion polymerization process irradiated by microwave in a reduced time interval. The amount of waste product obtained is minimum. The use of microwave (MW) irradiation is one of the greatest methods to synthesize the polymers and nanocomposites. Due to homogeneity, high efficiency and low energy consumption, microwave-assisted chemical synthesis has attracted wide attention that increases the rate of polymerization rapidly and improve the properties of the products. Rapid reaction of emulsion polymerization and high percentage of the products with very less energy consumption has been catalyzed by microwave assisted transition metal complex. The non-conventional emulsifier-free emulsion polymerization has been chosen to prepare required polymer nanocomposites, because it is both time and energy saving process [1]. The emulsion polymerization is a unique process which controls the chain initiation, propagation, chain transfer and chain termination easily [2].

Guar gum is a hydrophilic and non- ionic polysaccharide polymer which is easily available, very cheap and non-toxic polysaccharide. So it is broadly used in many industrial fields and chemical laboratories etc. It consists of a straight chain of mannose units which act as highly efficient water thickening binding, stabilizing, and emulsifying agents. Guar gum based materials can be modified by cross linking or grafting in microwave irradiation. [3,4]. Grafting by microwave irradiation is a suitable method with fast reaction and high yield. Superabsorbent polymers are reasonably cross- linked, hydrophilic network that can absorb and sustain large quantities of aqueous fluids retaining their shapes [5,6]. They are broadly used such as hygienic products i, e .disposable diapers and feminine napkins, gardening in desert areas due to unique property. Swelling behavior and Biodegradability of prepared nanocomposites superabsorbent can be studied which have wide range of applications on elements of the environment and will have positive effect in green revolution .

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Regioselective Synthesis of Pyrazole based 2-aryl-3-nitro-2H-chromanes via aza-Michael addition reaction under catalyst free condition



Tapaswini Das¹ | Seetaram Mohapatra¹

¹Organic Synthesis Laboratory, Department of Chemistry, Ravenshaw University,
Cuttack-753003, Odisha, India

E.mail: dastapaswini70@gmail.com

Abstract:

Densely functionalized 2, 3, 4-trisubstituted chromane derivatives and their 4-amino skeletons are the most important structural building blocks of many bioactive natural and unnatural alkaloids possessing potent biological activities such as bactericides, antioxidant, anti-hypertensive, anti-cancer agents and in medicinally enriched drug candidates such as cromakalim, NIP-142, HMR 1556, chromanol 293B [1] etc. Amongst the procedures available in chemist's toolbox for the construction of 2, 3, 4-trisubstituted aminochromane, aza-Michael addition reaction has emerged as a very popular method and also plays major role in providing ubiquitous nitrogen-oriented essential skeletons in modern organic synthesis [2]. On the other hand, pyrazole is a synthetically interesting heterocyclic molecule shows fascinating therapeutic activities like anticancer, antitumor, anti-AIDS, antimicrobial, antimalarial, antifungal and antitubercular properties [3]. Considering the biological activities as well as abundance in many potent drug candidates of these 2,3,4-trisubstituted aminochromanes, herein, regioselective synthesis of 1-(3-nitro-2-aryl chroman-4-yl)-1H-pyrazole derivatives have been disclosed via tandem aza-Michael addition reaction of substituted pyrazoles to 2-aryl-3-nitro-2H-chromene derivatives at room temperature. This protocol was generated in one-pot transformation with good to high yield with excellent regioselectivity. The absolute configuration of the product was confirmed by a single crystal X-ray study. Easy accessibility, base and catalyst free condition, wide substrate scope, high yields and excellent regioselectivity are the major features of this protocol.

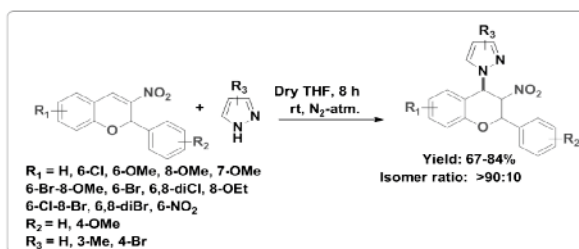


Fig. 1. Synthesis of 2,3,4-trisubstituted amino-2H-chromane.

Keywords: Aza-Michael addition, regioselectivity, pyrazole, Single crystal X-ray, 2, 3, 4-trisubstituted amino chromane.

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Synthesis of Novel Chromene based Spirocyclic Molecules by [4+2] Cycloaddition Reaction



Jasmine Panda¹ | Sabita Nayak¹

¹ Organic Synthesis Laboratory, Department of Chemistry, Ravenshaw University, Cuttack-753003, Odisha, India

E.mail: jasminepanda1998@gmail.com

Abstract :

A general, highly efficient and novel protocol for the synthesis of biologically important 2'H-spiro[indene-2,3'-pyrano[2,3-c]chromene derivatives in good to excellent yields has been developed by [4+2] cycloaddition reaction as the key step under conventional conditions. The protocol involves a multi-step synthesis initiating from *o*-hydroxy acetophenone and substituted ketones by aldol condensation followed by intramolecular cyclization.^[1] The substituted 2*H*-chromenes hence formed undergoes reaction with PBr₃ to give substituted 4-bromo-2*H*-chromenes.^[2] The Heck coupling reaction of 4-bromo-2*H*-chromene and substituted styrenes under microwave irradiation provides 4-styryl-2*H*-chromene which reacts as diene with ninhydrin as dienophile by Diels-Alder reaction to provide the final targeted spiro molecules.^[3,4] The advantageous features of this methodology include operational simplicity, easy handling, high yield and good substrate scope. All the compounds were characterized by ¹H NMR, ¹³C NMR, DEPT and HRMS spectroscopy.

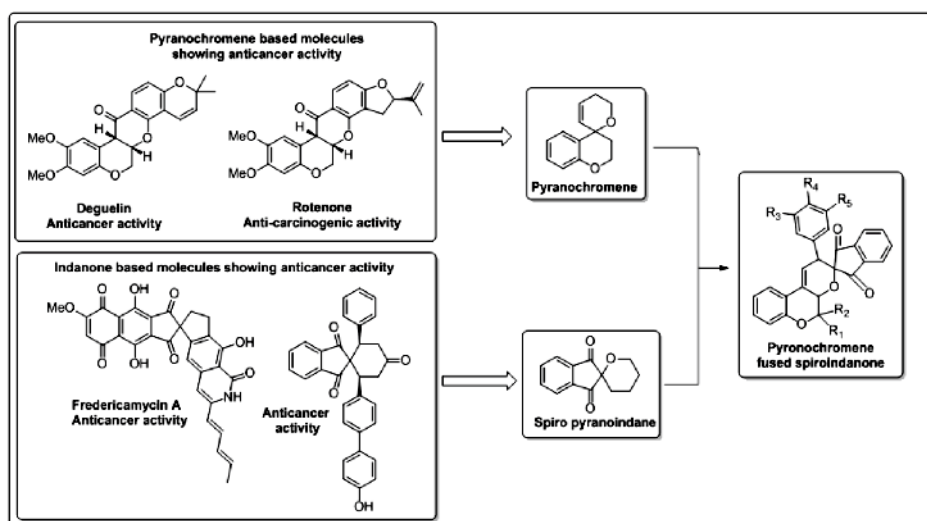


Fig. 1. Synthesis of 2'H-spiro[indene-2,3'-pyrano[2,3-c]chromene derivatives

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Acknowledgements : We are thankful to INSPIRE Programme Division (Ref. DST/INSPIRE/03/2021/000846, New Delhi) for providing financial support in the form of INSPIRE FELLOWSHIP and DST Odisha (Ref. 2692/ST, Bhubaneswar, dated 16.07.2020) and also thankful to DST-FIST New Delhi for providing NMR facility.

Flavone-stilbene hybrids: Synthesis and evaluation as potential antimalarial agents



Bishnu Prasad Raiguru¹ | Seetaram Mohapatra¹ | Dinkar Sahal² | Mamta Yadav²

¹Organic Synthesis Laboratory, Department of Chemistry, Ravenshaw University, Cuttack-753003, Odisha, India

²International Centre for Genetic Engineering and Biotechnology, New Delhi, India

E.mail: bishnuprasadtuna@gmail.com

Abstract:

A series of flavone-stilbene-based hybrid molecules were synthesized in good to excellent yield (65-95%) via Heck coupling as the key step under conventional as well as microwave irradiation conditions. The advantages of the developed protocol involve short reaction time, high yield products obtained without the use of any additives and the ability to obtain pure compounds by recrystallization obviating the need for time-consuming column chromatography. These synthesized hybrid molecules were evaluated for their *in vitro* anti-plasmodial activity against chloroquine-sensitive Pf3D7 and chloroquine-resistant PfINDO strains of the malaria parasite *Plasmodium falciparum* using SYBR Green I assay. The compound **11g** {IC₅₀s (μM) 6.013D7, 5.67INDO} is the most promising anti-plasmodial compound in the series of flavone-stilbene hybrid molecules. The <1 With their CC₅₀s > 200 μM the compounds were found to be non-cytotoxic towards mammalian cell line (HEK-293). The covalent hybridization of flavones and stilbenes significantly enhanced their antiplasmodial activity in comparison to individual flavone, stilbenes and their equimolar mixture. Most of the potent compounds were non-hemolytic leading to the conclusion that their anti-plasmodial potency was through their actions specific to the parasite and not towards RBCs. With considerable promise as novel drugs against drug-resistant malaria parasites, it is expected these novel hybrid compounds upon further hit-to-lead optimization studies could enable us to develop new antimalarial drugs based on flavone-stilbene hybrid structures.^[1]

Keywords: Heck coupling, *Plasmodium falciparum*, antimalarial activity, flavone-stilbene hybrid.

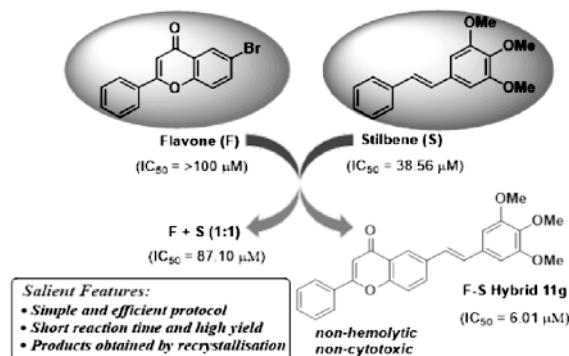


Fig. 1. Synthesis of flavone-stilbene-based hybrid molecules and their anti-plasmodial studies.

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Development of Tooth Care Tool that Cures Tooth Troubles : A Novel Study

S K Rana¹, Pravat K. Swain ²

Polymer & Industrial Consultant

356 D Katwaria Sarai, Hauz Khas, New Delhi: 110016, India. drskrana@yahoo.com

Department of Chemistry, Satyasai Engineering College Balasore-756002, Odisha, India

Abstract :

Tooth troubles eg., pyorrhea, gingivitis, aches and tooth pain are very common in populace. This tooth care tool cures almost every tooth troubles with in a reasonable time periods. A significant change in dental troubles can be felt by 20 days on regular use. This loop like tooth brush cures tooth troubles through following mechanisms: removes food deposits & debris physically to curtail the growth of dental detrimental bacteria, kills these bacteria etc by emitting antibacterial silver on rubbing over tooth surfaces, and effectively cleanse tooth surfaces that help assimilate natural calcium present in saliva for rejuvenation. This product is tested, tried and is being used locally with 100 % success rate.

Introduction : This article discusses about the design and development of a tooth tool that cures common dental ailments. This tooth tool highly simplifies the maintenance and care of teeth so that taking care of teeth becomes easy and resulting in better and bright tooth. Due to better maintenance, teeth do not fall easy prey to ailments. It is very simple to use. One explanation and/or demonstration is enough using the tool properly. Unlike other existing dental tools those work on point to point cleaning, this tool works on wide teeth surface cleaning. Thus, this tooth tool is more effective and efficient. Furthermore, one can alone use it unaided.

Literature : Many of the tooth ailments are related to the dental deposits. The root cause of dental ailments is adherence of food film or debris that converted to plaques, tartar, and calculus etc and may ultimately lead to the dental decay and cavity formation. Williams (1) was credited with the slogan that, "a clean tooth does not decay". Meckel (2) showed that teeth scraping contains unstructured layer of organic film. Tooth picks up biofilms regularly while eating and then the film subsequently act hosting bacteria etc. The biofilms become a dental deleterious bacterial colony and causes tooth to decay. The colony spreads by shearing off and hinging it to other location and spreads tooth disease. Hence, our aim in this work is to keep teeth neat and clean using tooth tool so as to refrain teeth from catching ailments.

Design : This innovative tooth tool effectively, efficiently and positively cleans the food adherence from teeth. The design concepts is that the tool should be: simple and effective; equal or more hard than teeth to scrap adhered film effectively (low pressure film transfer); sturdy enough to positively remove the already formed hard deposits (calculus etc) and soft masses; accesses nooks & corners of teeth and junctions; and lastly should not have any cutting surfaces. From a designed composition of steel, wire was spun to round shape and round conformation was given to make a loop like tooth brush (Fig 1).

Manufacture : The steel wire was produced, drawn and annealed to attain a highly smooth surface with a dia of 0.3 mm. About 72 strands were taken for making a tight flat braid of 10 mm wide. The braid was then shaped to a 10 mm dia loop. This loop wire head was mounted on a stick (handle) for easy operability.

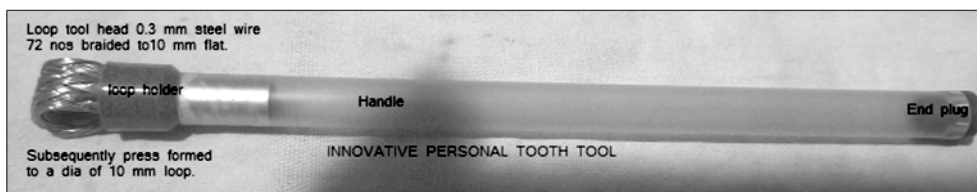


Fig 1. Design details of innovative tooth tool

Use : The tooth tool is used like a tooth stick to scrub and brush dental and gum junctions respectively. Primarily, the tool surface should touch and rub teeth surfaces for effective cleaning. The tool head pulls along food films and deposits cohesively. Pulling of dirt and debris is gentle and soft and no way hurts tooth or gum. The tool is rigid that exerts soft action for cleaning; on the other hand regular toothbrush is a soft tool that exerts hard action (due to its cutting edge). Tooth tool cleanse teeth better than regular toothbrush. Figure 2 compares a result showing the differences between regular brushing and that of tooth tool after 30 day use. The tooth tool cleaned teeth set are brighter than the regular toothbrush one.

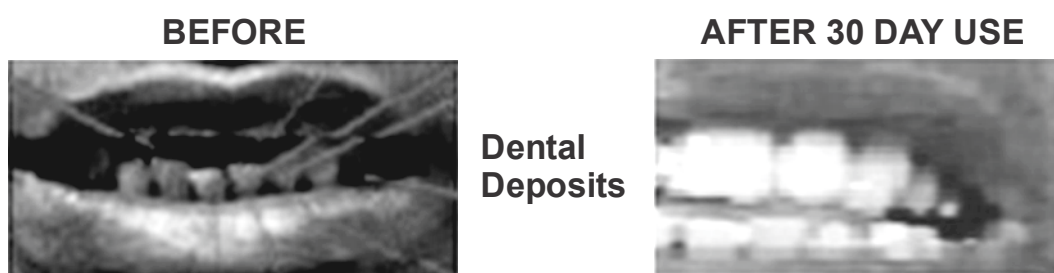


Fig 2. Comparison of appearance of teeth between regular brush and the tooth tool use. The tooth tool was used only for 30 days while the photographed.

Current Status: Currently this tool is under evaluation for daily use. People use this tool just after regular tooth brushing to get rid of dental pain and aches. Results are quite encouraging. A young pharmacist has his tooth trouble subdued by the use & a man in late 60s is beneficiary of thermal sensitivity of tooth. In another case, the patient is recovering from severe gingivitis. There are about 50 pieces of tool under use reporting good results. It seems that innovative tooth tool posses huge potential in treating common dental ailments. It also helps maintaining and grooming teeth. We are looking forward to use it as a paste less toothbrush in future so that the chemical complications arise of tooth paste are put to rest.

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Exploration of Antitubercular activities of some newly synthesized inclusion complexes of N-((5-methylfuran-2-yl)-methylene) and N-((5-nitrofuran-2-yl)-methylene)-[1,3,4]-thiadiazino-[6,5b] indole-3-amine with β -CD.

Dr. Pramoda Kumar Das, Bindu Sagar Sahoo

Department of Chemistry, Kendrapara Autonomous College, Kendrapara

ABSTRACT

In the context of present medicinal advancement, the research has been carried out to synthesize some indole derivatives having antitubercular activity through inclusion complex formation with β -Cyclodextrin. Since there are fewer anti TB drugs available and there is an ever increasing fear of drug resistance, it is becoming more and more essential to synthesize some new drugs with higher potency and low toxicity. So with an objective of exploring the potent antitubercular activities, two different Schiff bases of indole moiety, (5-substituted furan-2-yl) (1,3,4) thiadiazino[6,5b] indole-3-amine were synthesized.

To enhance the stability, solubility, bio-accessibility and the antitubercular activities of these synthesized compounds, their inclusion complexes have been prepared with β -Cyclodextrin, a suitable host molecule and a useful molecular encapsulant.

The compounds along with their inclusion complexes are studied for their antitubercular behaviour by using Rifampicin as the reference compound. The study is conducted at lower to higher concentration and the result showed minimum inhibitory concentration for inclusion complexes (2ug/cc) than the compounds (4ug/cc). This shows the profound antitubercular activity of the inclusion complexes as compared to their respective compounds.

Key words- Schiff bases, inclusion complex, antitubercular activity, β -Cyclodextrin

Cp₂TiCl-mediated Reductive Cyclization : Total Synthesis of Natural Products

*Sabnam Begum and Tushar Kanti Chakraborty**

ABSTRACT :

The free radical epoxide opening with concomitant cyclization reaction mediated by Cp₂Ti(III)Cl has been used for the total synthesis of many natural products and advance synthons.¹⁻³ To explore the versatility of this method, we have recently reported first stereoselective total syntheses of (+)-pestalotiolactone A, (-)-myrotheciumone A and (+)-scabrol A using the Ti(III)-mediated reductive epoxide opening-cyclization protocol as a key step to assemble the bicyclic lactone core of these molecules with complete diastereoselectivity. Finally, the deoxygenation and methylation delivered the target natural products.⁴

Synthesis of Biologically Active Heterocyclic Compounds and Its Application

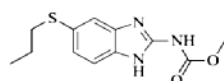
Sagarikapatra and Dr. BibhutiBhusanParida

Sagarika1996patra@gmail.com

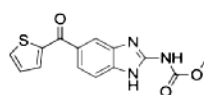
P. G. Department of Chemistry, Berhampur University, Odisha

Abstract:

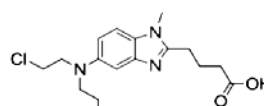
The heterocyclic scaffolds are biologically ubiquitous in nature which plays a major role towards the development of green and sustainable chemistry. Various advances have been made towards the synthesis of these compounds but among them catalytic method of synthesis has gained a lot of attention now a days. Synthetic indolizidine analogs having various pharmacological properties such as Penciline (antibiotic), cyclosporine (immunosuppressant), azidothymidine (HIV), sofosbuvir (hepatitis-c) which have changed the world for the better. Indolizidine, a class of N-heterocyclic compounds which contain one-six membered ring fused to a five membered ring bridging through a nitrogen atom have varied range of biological activities. The structure-Activity-Relationship (SAR) studies led derivatives of Indolizidines, which could be tested against the different oncocyte lineages for the development of the drugs, used in different chemotherapy. Indeed, a green and simple access to a wide variety of N-heterocyclic compound is of crucial importance for drug discovery programs.



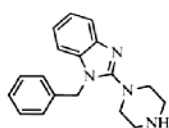
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(Antiprotozoal)



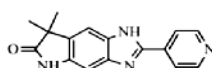
Nocodazole
(Anticancer)



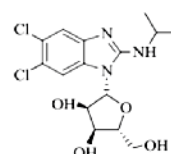
Veliparib
(Anticancer)



Lerisetron
(Antihistaminic)



Adibenden
(Phosphodiesterase inhibitor)



Maribavir
(Antiviral)

Keywords : Green catalysis; Bioactive Compounds; Heterocyclic Scaffolds; Oncocytes; Chemo-therapy.

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Cations from Soil to Host Leaf and its possible Role in Silk Synthesis of Tropical Silkworm

Sasmita Panda* and Pramod Kumar Satapathy

F.M (Auto) College, Balasore

P.G. Department of Chemistry, Sriram Chandra Bhanja Deo University, Baripada, Mayurbhanj

ABSTRACT

Synthesis of silk involves a cascade of biochemical pathways involving numerous enzymatic reactions and involves conformation transition of the liquid silk protein to form silk fibre and is induced by several factors including change in the cationic concentration. The tropical tasar silkworm produces Vanya silk of commercial importance. Different rearing seasons cause a change in the life cycle strategy of tasar silkworm, hence there is a marked difference in the quantity of silk produced in different agro-climatic conditions. A study was conducted to find out the relationship of soil and host leaf cations with respect to the silk yield of tasar silkworm reared in two ecologically different locations on two host plants over rainy and autumn rearing seasons. The study revealed significant variation in silk traits with respect to place and season with highest values recorded at Kendujuani in the cocoons formed on Asan plant. Silk filament length was recorded, autumn crop (855 m) and rainy (512 m) at Kendujuani. The trend was similar with significantly less value ($P < 0.01$) at Chandua. Among the nine cations studied, variation was observed for different rearing season, Mg^{2+} , Ca^{2+} , Na^+ and Zn^{2+} were found to be significantly in higher concentration in host plant leaves during autumn crop ($P < 0.05$) with highest value in Kendujuani ($P < 0.01$) whereas no significant difference was recorded for Fe^{2+} , Mn^{2+} and Cu^{2+} . The larval feeding period during autumn crop is more (45 days) in comparison to rainy crop (28 days), hence selective accumulation of cations by silkworm and their role in silk synthesis is preeminent. Further, the role of Mg^{2+} , Cu^{2+} , Zn^{2+} , Ca^{2+} and K^+ in the protein conformation transition and helical conformation to β -sheet of silk along with associated factors is discussed in this paper.

Key words : *Antheraea mylitta*, leaf micronutrient, soil micronutrient, tasar silk
