CRITERION-III

RESEARCH, INNOVATIONS AND EXTENSION

3.3 RESEARCH PUBLICATIONS AND AWARDS

3.3.1 Number of research papers published per teacher in the Journals notified on UGC CARE list in 2018-2023

Link to website of the Journal

Index

Research papers published in 2020

Sr. No.	Title of paper	Name of the author/s	Department of the teacher	Name of journal ISSN number	Link to article / paper / abstract of the article
1	Electrochemical behavior of hydrothermally synthesized porous groundnuts-like samarium oxide thin films	S. B. Ubale, T. T. Ghogare, V. C. Lokhande, T. Ji, C. D. Lokhande	Chemistry	SN Applied Sciences 2523-3963	https://doi.org/10.1007/s42452-020-2467-z
2	Rapid and Size-Controlled Biosynthesis of Cytocompatible Selenium Nanoparticles by Azadirachta indica Leaves Extract for Antibacterial Activity	N. A. Mulla, S. V. Otari, R. A. Bohara, H. M. Yadav, S. H. Pawar	Microbiology	Materials Letters 1873-4979	https://www.sciencedirect.com/science/article/abs/pii/S0167577X20300586

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3	One-step hydrothermal synthesis of magnetic rice straw for effective lipase immobilization and its application in esterification reaction	S.V. Otari, S. K.S. Patel, V. C. Kalia, J-K. Lee	Microbiology	Bioresource technology 1873-2977	https://www.sciencedirect.com/science/article/abs/pii/S0960852420301565
4	Binder free lanthanum doped manganese oxide@ graphene oxide composite as high energy density electrode material for flexible symmetric solid-state supercapacitor	V. J. Mane, D. B. Malavekar, S. B. Ubale, R. N. Bulakhe, I. In, C. D. Lokhande	Chemistry	Electrochemical Acta 0001-5164	https://doi.org/10.1016/j.electacta.2020.135613
5	Evaluation Of In-Vitro Anti-Bacterial And Cytotoxic Activity Of Leea Macrophylla	Prakash M. Somade, Atul R. Chopade , Pramod A. Patil and Suryakant B. Kengar	Zoology	International Journal of Pharmaceutical Sciences and Research 2320-5148	https://ijpsr.com/bft-article/evaluation-of-in-vitro-anti-bacterial-and-cytotoxic-activity-of-leea-macrophylla/
6	Manganese dioxide thin films deposited by chemical bath and successive ionic layer adsorption and reaction deposition methods and their supercapacitive performance	V. J. Mane, D. B. Malavekar, S. B. Ubale, V. C. Lokhande, C. D. Lokhande,	Chemistry	Inorganic Chemistry Communications 1387-7003	https://doi.org/10.1016/j.inoche.2020.107853
7	I am not human at all!	Arvind T. Jadhav	English	Indian Literature 0019-5804	https://www.jstor.org/stable/27266860

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8	Fluorescence resonance energy transfer from pyrene nanoparticles to riboflavin: Spectroscopic insights and analytical application	Dhanshri V. Patil, Vishal S. Patil	Chemistry	Indian Journal of Chemistry: Section A, 59A 0975-0975	http://nopr.niscpr.res.in/handle/123456789/54684	
9	Enhanced energy density of flexible asymmetric solid state supercapacitor device vii fabricated with amorphous thin film electrode materials	D. B. Malavekar, V. C. Lokhande, V. J. Mane, S. B. Ubale, U. M. Patil, C. D. Lokhande	Chemistry	Journal of Physical Chemical Solids 0047-2689	https://doi.org/10.1016/j.jpcs.2020.109425	
10	A novel FRET probe for determination of fluorescein sodium in aqueous solution: Analytical	Dhanshri V. Patil, Vishal S. Patil	Chemistry	Indian Journal of Chemistry: Section A, 59A 0975-0975	http://nopr.niscpr.res.in/handle/123456789/52722	
11	Chemical synthesis of nano-grained ytterbium sulfide thin films for supercapacitor application	S. B. Ubale, R. N. Bulakhe, V. J. Mane, D. B. Malavekar, I. In, C. D. Lokhande	Chemistry	Applied Nanoscience 1944-8244	https://doi.org/10.1007/s13204-020-01495-8	
12	*Chrysopogon shrirangii* sp. nov. (Poaceae: Andropogoneae) from Karnataka, India	Shaikh Tarbej, Pooja Mane and Girish Potdar	Botany	Nordic Journal of Botany 0107-055X	https://doi.org/10.1111/njb.02753	
13	ENVIROCAT EPZG AS A HETEROGENEOUS CATALYST FOR THE SYNTHESIS OF 3,3-DISUBSTITUTED OXINDOLES	Rahul Patil, Uday Lad, Suresh Shendage and Uttam More	Chemistry	Rasayan Journal of Chemistry 0974-1496	https://www.rasayanjournal.co.in/admin/php/upload/1048_pdf.pdf	

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14	Stereospecific Synthesis of (4E,10Z)-4,10-Tetradecadienyl Acetate, the Major Sex Pheromone of Apple Leaf Miner Moth, Phyllonorycter ringoniella	R. Awalekar, Kishor S. Jagadhane, S. Usmani, S. Salunkhe, D. Jamale, S. Hangirgekar, G. Kolekar, P. Anbhule*	Chemistry	Letters in Organic Chemistry 1875-6255	https://doi.org/10.2174/1570178617999200922145900	
15	EVALUATION USING IN-VITRO ASSAYS FOR GLUCOSE DIFFUSION AND KINETICS OF AMYLOLYSIS OF LEEA MACROPHYLLA STANDARDIZED EXTRACTS	SOMADE PRAKASH M, CHOPADE ATUL R , PATIL PRAMOD A AND KENGAR SURYAKANT B	Zoology	International Journal of Biology, Pharmacy and Allied Sciences 2277-4998	https://ijbpas.com/pdf/2020/September/MS_IJBPAS_2020_5173.pdf	
16	Nanostructured CdO-ZnO composite thin films for sensing application	A. K. Sharma, S. S. Potdar, V. S. Patil	Chemistry	Journal of Materials Science: Materials in Electronics 0957-4522	https://doi.org/10.1007/s10854-020-04607-w	
17	Conversion of biogas to methanol by methanotrophs immobilized on chemically modified chitosan	S. K. S. Patel, R. K. Gupta, S. Kondaveeti, S. V. Otari, A. Kumar, V. C. Kalia, J-K. Lee	Microbiology	Bioresource technology 1873-2976	https://www.sciencedirect.com/science/article/abs/pii/S0960852420310634	

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Electrochemical behavior of hydrothermally synthesized porous groundnuts-like samarium oxide thin films

Short Communication Published: 25 March 2020

Volume 2, article number 756, (2020) Cite this article

S. B. Ubale, T. T. Ghogare, V. C. Lokhande, T. Ji & C. D. Lokhande

Abstract

One pot hydrothermal method is used for synthesis of groundnuts-like samarium oxide (Sm_2O_3) thin film on stainless steel substrate. The Sm_2O_3 film is characterized by X-ray diffraction, water contact angle, UV–visible spectrophotometer, photoluminescence, and field emission scanning electron microscopy techniques. The hydrothermal method allows the formation of cubic Sm_2O_3 film with porous groundnuts-like morphology. The Sm_2O_3 film is hydrophilic with the optical band gap of 3.70 eV. Electrochemical capacitive behavior of Sm_2O_3 film is studied using cyclic voltammetry, galvanostatic charge–discharge measurement and electrochemical impedance spectroscopy. The Sm_2O_3 film

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Rapid and size-controlled biosynthesis of cytocompatible selenium nanoparticles by *Azadirachta indica* leaves extract for antibacterial activity

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ABSTRACT

Biosynthesized selenium nanoparticles (SeNPs) have achieved considerable importance in biomedical applications owing to their biocompatibility and low toxicity. In this study, rapid and size-controlled biosynthesis of SeNPs by aqueous leaves extract of *Azadirachta indica* is reported. SeNPs were synthesized by reduction of Se^{+} ions of sodium selenite salt to elemental selenium. Biosynthesized SeNPs were crystalline in nature and spherical in shape with a smooth surface. The size of these SeNPs was controlled by adjusting the time of reduction reaction. Accordingly, SeNPs of size range 142 to 168 nm and 221 to 328 nm were synthesized after 5 and 10 min of reaction respectively with 10 mM initial concentration of sodium selenite. Fourier Transform- Infra Red (FT-IR) analysis revealed the presence of plant extract molecules on the surface of SeNPs acting as reducing agent and capping molecules. These biosynthesized SeNPs were found to be cytocompatible in nature when tested *in-vitro* against the L929 cell line by MTT assay. In addition, these biosynthesized SeNPs showed promising antibacterial activity against selected Gram-positive and Gram-negative bacterial strains.

1. Introduction

Numerous reports in the last decade clearly demonstrated the advantages of biogenic selenium nanoparticles (SeNPs) over physically and chemically synthesized SeNPs due to biocompatibility, nontoxic nature, colloidal stability and avoidance of extreme temperature and pressure in synthesis method [1]. Among different biosynthesis routes available, plant mediated SeNPs biosynthesis have gained significant attraction due to the simplicity of reaction and ease of purification [2]. In recent studies, various plant sources and plant materials were successfully employed for the biosynthesis of SeNPs [3]. However, none of these studies was successful in rapid biosynthesis of SeNPs with the capability to control the size of the nanoparticles [Table S1]. Therefore, it was important to develop a rapid plant mediated SeNPs synthesis method offering considerable control on the size of synthesized nanoparticles. Published reports regarding antibacterial activity of chemically synthesized [4] and biosynthesized [5,6] SeNPs demonstrated the potential of SeNPs as an antibacterial agent against Gram-positive and Gram-negative bacterial strains. Responding to these facts, present study deals with the rapid and size-controlled biosynthesis of SeNPs by aqueous leaves extract of *Azadirachta indica* as a green chemistry approach, and investigation of *in-vitro* cytocompatibility and antibacterial potential of these SeNPs.

2. Experimental

2.1. Preparation of leaves extract

Details are provided in the Supplementary file.

2.2. Biosynthesis and purification of SeNPs

Details are provided in the Supplementary file.

2.3. Characterizations of SeNPs

Details are provided in the Supplementary file.

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One-step hydrothermal synthesis of magnetic rice straw for effective lipase immobilization and its application in esterification reaction

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ARTICLE INFO

Keywords:
Magnetic rice straw
Lipase
Enzyme immobilization
Esterification

ABSTRACT

Immobilization of industrially important enzymes on supports is important to decrease the cost of the overall enzymatic production procedure. Herein, a novel method for synthesizing a new support, magnetic rice straw (MRS) in one step is reported: rice straw (RS) was soaked with Fe^{2+} ions and these were further reduced to form embedded Fe_2O_3 nanoparticles on the RS surface, forming MRS. This material presented a magnetic saturation value of 27.32 emu g^{-1}. Lipase immobilization on MRS resulted in 94.3% immobilization efficiency and 91.3 mg g^{-1} of enzyme loading, which are higher than immobilization on native RS. The lipase stability was increased approximately 8-fold at 70 °C. The lipase-MRS composite was tested in the esterification reaction of biodiesel production, where it showed prominent reusability. Therefore, this novel and rapid synthesis method can provide ecological and economic support for enzyme immobilization and industrially important product formation.

1. Introduction

Increased shelf life and stability during industrial production are the prime requirements for biocatalysts such as enzymes to render processes economically viable. Various forms of support have been used for the immobilization or encapsulation of biocatalysts (Kumar et al., 2019; Otari et al., 2019; Patel et al., 2016, 2017, 2018). Among economic and ecologically friendly support sources for enzyme immobilization, natural materials are available in abundance and can be used with few modifications, lowering process cost in relation to synthetic supports and avoiding the use of expensive and hazardous chemicals. Park et al. used wood mimetic composite hydrogels for lipase encapsulation, where the wood components were treated with an ionic liquid to form a spherical hydrogel and encapsulate the lipase (Park et al., 2015). Paper waste-extracted cellulose nanofiber was also used for laccase immobilization for pollutant degradation (Ghodake et al., 2018). Even though an enzyme immobilized on a support has better properties than a free enzyme, ensuring easy and efficient recovery and purification of the immobilized enzyme is a challenge that affects the economics of the immobilization process (Bilal et al., 2018). Therefore, the construction of an ecologically friendly and economical support based on rice straw (RS) modified with magnetic nanoparticles by a novel, one-step method is proposed in the present study.

RS is a feedstock with the biggest surplus availability worldwide; rice crops grow in a hundred countries, producing millions of tons of RS every year. More than 50% of the produced RS is used as fodder for cattle or in the wood industry. The remainder of the RS is being improperly handled; it is burnt, producing hazardous gases such as carbon mono-dioxide, volatile organic compounds, and nitrous oxides with suspended particulate matter. To avoid severe damage to the environment, the produced RS must be managed in an efficient way to generate value-added products. Das et al. used RS for whole cell immobilization in ethanol production (Das et al., 1993). There are several reports of rice straw being used as lignocellulosic biomass for bioethanol production because it contains high levels of cellulosic and hemicellulosic materials that can be readily converted to fermentable sugars. Among the various methods available for the pretreatment of lignocellulosic material, such as acid, alkaline, steam explosion, organosolvo, and hydrothermal methods, the hydrothermal method is favored as a rapid, easy, and dry method for lignocellulosic material containing high moisture content (Sun et al., 2018; Chandra et al., 2012; Li et al., 2019). Though RS has been extensively utilized for bioethanol production, very few or no studies have been performed on the use of lignocellulosic biomass for lipase enzyme immobilization and further exploration for biodiesel production.

Lipase is the most studied and industrially utilized enzyme that catalyzes esterification, transesterification, aminolysis, and alcoholysis reactions (Gao et al., 2017; Kumar et al., 2018a). Most lipase substrates

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Electrochimica Acta

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Binder free lanthanum doped manganese oxide @ graphene oxide composite as high energy density electrode material for flexible symmetric solid state supercapacitor

V.J. Mane [a], D.B. Malavekar [a], S.B. Ubale [a], R.N. Bulakhe [b], Insik In [b c], C.D. Lokhande [a]

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https://doi.org/10.1016/j.electacta.2020.135613

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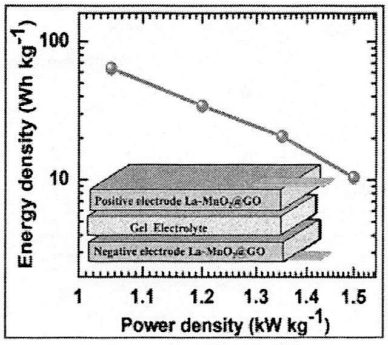
Abstract

The present work is about synthesis of La doped (1–5 vol %) manganese oxide (MnO_2) @ graphene oxide (GO) composite electrode. The thin films are obtained using a facile and binder free successive ionic layer adsorption and reaction (SILAR) method. The scanning electron microscopic image of 3%La–MnO_2@GO composite thin film shows porous spongy-like nanoparticles. Nitrogen desorption analysis shows that mesoporous sheets of 3%La–MnO_2@GO exhibits large surface area up to 149 m^2g^{-1}. The highest electrochemical specific capacitance of 729 Fg^{-1} at the scan rate of 5 mVs^{-1} is obtained for 3%La–MnO_2@GO electrode. The 3%La–MnO_2@GO thin film electrode exhibits 94% capacitive retention over 5000 CV cycles. The flexible symmetric solid state supercapacitor device of configuration SS/3%La–MnO_2@GO/PVA-Na_2SO_4/3%La–MnO_2@GO/SS operating in potential window 1.8 V shows maximum specific capacitance of 140 Fg^{-1} with energy density of 64 Wh kg^{-1} at power density of 1 kW kg^{-1} and capacitive retention of 90% after 5000 CV cycles at the scan rate of 100 mVs^{-1}.

Graphical abstract



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IJPSR (2020), Volume 11, Issue 5 **(Research Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

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EVALUATION OF *IN-VITRO* ANTI-BACTERIAL AND CYTOTOXIC ACTIVITY OF *LEEA MACROPHYLLA*

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Department of Pharmacology [2], Rajarambapu College of Pharmacy, Kasegaon - 415404, Maharashtra, India.
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Keywords:

Leea macrophylla, Antibacterial activity, Brine shrimp lethality assay

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ABSTRACT: Studies have confirmed the medicinal potential of the *Leea macrophylla* mentioned in traditional medicine. While the effects of the *Leea macrophylla* extract on some bacteria and Brine shrimp lethality using their different concentrations has not been previously explored. The present study shows that the standardized aqueous and ethanolic extract of *Leea macrophylla* exhibited antibacterial and cytotoxic activity. The findings of the present work provide promise for the development of new molecules of treat microbial infections and cancer.

INTRODUCTION: *Leea macrophylla* (Roxb.) (Family: Leeaceae) is a herb or herbaceous shrub with a very big size leaf like an elephant-ear. The plant parts of Leea macrophylla are used by tribal people in the cold, cough, headache, tetanus, *etc.* [1, 2] It also has ethnobotanical uses in goiter, gastric tumor, lipoma body pain and rheumatic pain [2-5]. Although *Leea macrophylla*. *Leea macrophylla* has various ethnopharmacological uses; the plant have not been investigated for antimicrobial and cytotoxic activity against prominent gram-positive and gram-negative human pathogenic bacterial strains. Besides, cytotoxic activity screening of the extracts was also carried out with view to assess the presence of antitumor activity of different extracts.

QUICK RESPONSE CODE

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In-vitro lethality test has been successfully used as a preliminary study of cytotoxic and antitumor agents.

MATERIALS AND METHODS:

Preparation of Extracts: The plant species *Leea macrophylla* [Roxb.ex Hornem] belonging to Family: Leeaceae was collected from Kalgaon village Taluka. Patan, District- Satara and authenticated at Botanical department of Yashwantrao Chavan College of Science, Karad. The plant was dried under sunlight and fine powder of the plant was prepared by using a hand grinder.

Preparation of *Leea macrophylla* Aqueous Extract (LMAE): powder was mixed with 30 ml distilled water boiled for 30 min in round bottom flask attach with a reflux condenser. The material was filtered Whatman filter paper no 40, and filtrate was collected.

Preparation of *Leea macrophylla* Ethanolic Extract (LMEE): powder was mixed with 30 ml

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Inorganic Chemistry Communications

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Manganese dioxide thin films deposited by chemical bath and successive ionic layer adsorption and reaction deposition methods and their supercapacitive performance

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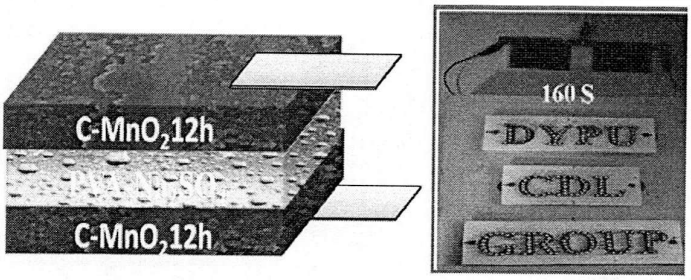
Abstract

In present work, MnO_2 thin films with tetragonal and birnessite-phases are deposited using chemical bath deposition (CBD) and successive ionic layer adsorption and reaction (SILAR) methods. The surface morphology of MnO_2 film is modified using different deposition parameters. These films are characterized by X-ray diffraction (XRD), fourier transform infrared (FTIR) spectroscopy, field- emission scanning electron microscopy (FE-SEM), Brunarer-Emmett-Teller (BET) and Barrette-Joynere-Halenda (BJH) method. The electrochemical properties are studied using cyclic voltammetry, galvanostatic charge–discharge and electrochemical impedance spectroscopy techniques in 1 M Na_2SO_4 electrolyte. The CBD method exhibits excellent electrochemical performance with maximum specific capacitance of 757F g^{-1} at scan rate 5 mVs^{-1}, energy density of 74 Wh kg^{-1} at power density of 1.5 $kWkg^{-1}$. The large area solid state symmetric devices fabricated with CBD MnO_2 film electrodes exhibit maximum specific capacitance of 128F g^{-1} with energy density of 14 Wh kg^{-1} at power density of 0.2 $kWkg^{-1}$ with capacitive retention of 90% after 5000 CV cycles. Such device is able to glow 211 red LEDs for the period of 160s, showing it's possible potential for commercialization.

Graphical abstract



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Introduction

Indian Journal of Chemistry
Vol. 59A, June 2020, pp. 783-789

Fluorescence resonance energy transfer from pyrene nanoparticles to riboflavin: Spectroscopic insights and analytical application

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The aqueous suspension of fluorescent pyrene nanoparticles (PyNPs) have been prepared by a reprecipitation method in the presence of sodium dodecyl sulphate (SDS) as a stabilizer. The PyNPs shows bathochromically shifted aggregation induced enhanced emission in the spectral region 400 nm to 600 nm peaking at 466 nm where Riboflavin (RF) absorbs strongly. The systematic fluorescence resonance energy transfer (FRET) experiments performed by measuring fluorescence quenching of PyNPs with successive addition of RF analyte has exploited the use of PyNPs as nano probe for detection of RF in aqueous solution with lower limit of detection 10.163×10^{-5} mol.L^{-1}. The fluorescence of PyNPs is quenched by RF and quenching is in accordance with the Stern-Volmer relation. The distance r between the donor (PyNPs) and acceptor (RF) molecules has been obtained according to the FRET method. The evaluation of photo kinetic and thermodynamic parameters such as quenching rate constant (k_q), enthalpy change (ΔH), Gibbs free energy change (ΔG) and entropy change (ΔS) are calculated by quenching results obtained at different constant temperatures. The proposed FRET method based on fluorescence quenching of PyNPs is used further to develop an analytical relation for estimation of RF from pharmaceutical samples available commercially in the market.

Keywords Fluorescent pyrene nanoparticles, Riboflavin, Fluorescence resonance energy transfer

Riboflavin (7, 8-dimethyl-10-ribityl-isoalloxazine) also known as vitamin B_2 is a yellow fluorescent dye, unique among the water soluble vitamins and present in a wide variety of foods. It was firstly isolated from milk and given the name lactochrome. It can be crystallized as orange-yellow crystals[1,2]. This vitamin is an essential component of two major coenzymes flavin adenine mononucleotide (FMN, also known as riboflavin-5'-phosphate), and flavin adenine dinucleotide (FAD). These coenzymes play major roles in energy production, cellular function, growth, and development, and metabolism of fats, drugs, and steroids[3-5]. Various modern investigations strongly recommend that RF has tremendous potential to be used in improving the chemotherapeutic potential of major anticancer drugs[6]. It is very stable during thermal processing, storage and food preparation. It cannot be synthesized in the human body; therefore it must be obtained from dietary sources such as liver, cheese, milk, meat, eggs, wine and tea. Thus, consumption of vitamin B_2 depleted food can result in health problem. RF and related compounds are necessary for cell growth and development. On the other hand, its concentration in blood must be controlled while most of it is excreted through urine.[7–9]. The absorption spectrum of RF shows two bands peaking at 372 nm and 445 nm and is known for its characteristic fluorescence[10].

Fluorescence resonance energy transfer (FRET) is a non-radiative process whereby an excited state donor (D) transfers energy to a ground state acceptor (A). The donor and acceptor molecules are coupled by a dipole-dipole interaction. There is no intermediate photon in FRET, and it mainly occurs over distances comparable to most biological macromolecules, i.e., about 10–100 Å[2,11-12]. Organic probes based on fluorescence quenching approach are widely used for detection and sensing of molecules of physicochemical, biological and environmental concern[13-14]. Perylene, anthracene and pyrene are the most extensively used probes in micellar medium because of their high fluorescence quantum efficiency to sense biomolecules[15], pharmaceutical samples[16], dyes[17], and metal ions[18]. On the other hand, the use of aggregation-induced enhanced emission of nanoparticle suspension is of current research interest[19,20]. The technique of analysis

Journal of Physics and Chemistry of Solids 141 (2020) 109425

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journal homepage: http://www.elsevier.com/locate/jpcs

Enhanced energy density of flexible asymmetric solid state supercapacitor device fabricated with amorphous thin film electrode materials

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Amorphous materials
CuS
Electrochemical stability
High energy density
Flexible solid state supercapacitor
MnO_2
Thin film

ABSTRACT

Supercapacitors have recently received immense interest in scientific community, as a complementary technology to batteries, to meet the various requirements for energy usage in practice. Amorphous MnO_2 and CuS thin films are prepared on stainless steel-304 (SS) substrate by chemical bath deposition (CBD) and successive ionic layer adsorption and reaction (SILAR) methods, respectively. Asymmetric flexible solid state supercapacitor fabricated with configuration of SS/A-MnO_2/Polyvinyl acetate (PVA)-Na_2SO_4/A-CuS/SS delivered an impressive specific energy of 57.4 Wh kg^{-1} at specific power 317 W kg^{-1} and excellent cycling stability over 10,000 cycles with capacitive retention of 84%. Moreover, series configuration of two asymmetric devices shows the capability of powering 211 red LEDs for ~150 s after charging for 30 s.

1. Introduction

Nowadays, rising environmental problems push the world community towards the non-pollutant renewable energy sources. A lot of research is carried out towards the efficient conversion of available renewable energy. Neither a single renewable energy source gives continuous energy, which effectively accelerates the energy storage research in the past few decades. The batteries and supercapacitors (SCs) are commonly used energy storage devices for different purposes. While, former stores the energy by reversible chemical conversion of the integrated material, on the contrary in latter stored by either electrostatic double layer formation or pseudocapacitive mechanism. Commercially available batteries have good specific energy (S_E) but on the front of specific power (S_P), they lag far behind than capacitors and SCs [1]. Moreover, the SCs have attracted considerable interest as energy storage devices such as portable electronic products, backup power storage, electric vehicles, etc [2] in recent years, because of long life span compared to the commercially available batteries. The S_E of the SCs is very low which does not put them in a position to replace batteries. In this reference, the specific energy (S_E) of the SCs can be increased by manipulating two parameters, specific capacitance (C_S) and operating potential (V), according to the relation ($S_E = 0.5\ C_S.V^2$). Hence, preparing the electrode material which operates stably at high potential with high specific capacitance is a great deal.

Currently, most of the research is focused on the preparing desired electrode material which has good electrical conductivity, high specific surface area, high specific capacitance and stability under ambient conditions [3]. Most of the SCs are based on different carbon allotropes (activated carbon, carbon nano tubes, graphene, etc) having low C_S which leads to less S_E. Transition metal chalcogenides (TMCs) dominate the pseudocapacitive materials for electrochemical energy storage. As an example, MnO_2 has significant predominance such as abundance, low cost, and a high theoretical specific capacitance (1370 F g^{-1}) [4]. The other materials such as iron oxide (Fe_2O_3) [5], cobalt oxide (Co_3O_4) [6], copper oxide (CuO) [7], nickel oxide (NiO) [8,9], zinc oxide (ZnO) [10,11], copper sulfide (CuS) [12], etc along with these materials transition metal silicates are emerging as a new pseudocapacitive materials such as Cobalt silicate (Co_2SiO_4) [13] manganese silicate ($MnSiO_x$) [14], Nickel silicate ($Ni_2Si_3O_5$) [15], Cobalt-nickel silicate hydroxide ($Co_xNi_{3-x}Si_2O_5(OH)_4$) [16]. Cheng et al. fabricated amorphous Co_2SiO_4 nanobelts/graphene oxide composite which shows enhanced performance as an electrode in hybrid supercapacitor [17,18], have the advantage of low cost and environmental harmlessness and show the superior electrochemical performance in wide range of potential. The repeated interaction of the electrode material with electrolyte ions alters the structure of the material, dominantly. So, In case of stability of the

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A novel FRET probe for determination of fluorescein sodium in aqueous solution: Analytical application for ophthalmic sample

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Fluorescent pyrene nanoparticles (PyNPs) have been prepared by a reprecipitation method in the presence of sodium dodecyl sulphate (SDS) as a stabilizer. The formation of PyNPs has been confirmed by dynamic light scattering (DLS), UV-visible absorption spectroscopy, fluorescence spectroscopy and excited state lifetime measurements. DLS results of PyNPs shows a narrow size distribution with average particle size of 77.4 nm and negative zeta potential. The systematic FRET experiments performed by measuring fluorescence quenching of PyNPs with successive addition of FL-Na analyte exploited the use of PyNPs as nanoprobe for detection of FL-Na in aqueous solution. The fluorescence of PyNPs has been quenched by Fl-Na and quenching has been in accordance with the Stern-Volmer relation. The distance r between the donor (PyNPs) and acceptor (FL-Na) molecules has been obtained according to the fluorescence resonance energy transfer. The fluorescence quenching results have been used further to develop an analytical method for estimation of fluorescein sodium from ophthalmic samples available commercially in the market.

Keywords: Fluorescent pyrene nanoparticles, Fluorescein sodium, Fluorescence resonance energy transfer

Fluorescein sodium (FL-Na), also called uranine, is a non-toxic, low molecular weight and highly water-soluble dye, shows the physical property of fluorescence and commonly used as a quantitative fluorophore for studying different tissues of the eye[1-3]. Fl-Na shown in Fig. 1 is extensively used as a diagnostic tool in the field of ophthalmology and optometry. It is available as sterile single use sachets containing lint-free paper applicators soaked in Fl-Na[4]. It has a pK_a of 6.4 and its ionization equilibrium leads to pH-dependent absorption and emission over the range of 5 to 9. It can exist in seven prototropic forms, each of which possesses its own distinct spectral properties[5]. In neutral solutions, such as water and methanol (which also act as polar solvents) it exists mainly as dianion. It is widely used as fluorophore in the biosciences and as a fluorescent tracer for many applications[6]. Few methods have been used for detection and estimation of dyes[7-9]. A direct fluorimetric method requires separating the analyte from interfering constituents in the samples and having absorption in the region of analyte molecule. By contrast the fluorescence quenching/enhancement methods have high sensitivity and more simple detection and do not need separation of analyte molecules from other interfering constituents[10-13]. Therefore, the development of sensitive and selective sensors for FL-Na is of current interest.

Fluorescent organic nanoparticles (FONs) of low molecular weight functional compounds found special interest because of high variability and flexibility in materials and method of nanoparticles preparation[14-15]. Organic nanoparticles (ONs) occupy the intermediate state between isolated molecules and the bulk crystal. It is observed that most of the fluorescent organic materials belonging to the class of polynuclear aromatic hydrocarbons (PAHs) are water insoluble and gives their monomer emission in lower wavelength regions. PAHs are used as a fluorescent probe for the fluorescence quenching process[16-18]. Among the PAHs, Perylene and Pyrene are popular because of their large lateral π-orbital stacking between molecules and are most widely used probes

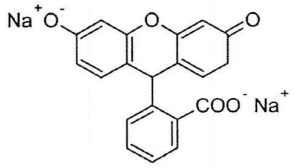

Fig. 1 — Structure of fluorescein sodium.

Chemical synthesis of nano-grained ytterbium sulfide thin films for supercapacitor application

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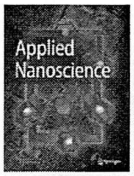

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S. B. Ubale, R. N. Bulakhe, V. J. Mane, D. B. Malavekar, Insik In & C. D. Lokhande

Abstract

Nano-grained ytterbium sulfide (Yb_2S_3) thin film is deposited by an inexpensive chemical bath deposition (CBD) method with excellent supercapacitive performance. The formation of Yb_2S_3 thin film is confirmed from XRD, FT-Raman, and XPS studies. The nano-grains like surface morphology of Yb_2S_3 thin film is observed using scanning electron microscopy and transmission electron microscopy techniques. The Yb_2S_3 film shows hydrophilic nature with a contact angle value of 61.2°. The electrochemical supercapacitive properties of Yb_2S_3 thin film are studied using cyclic voltammetry (CV), galvanostatic charge–discharge (GCD), and electrochemical impedance spectroscopy (EIS) techniques. The Yb_2S_3 thin film exhibits a specific capacitance of 184.6 F g^{-1} in 1 M KOH electrolyte at a 5 mV s^{-1} scan rate. The symmetric solid-state supercapacitor device of configuration Yb_2S_3/KOH-PVA/Yb_2S_3 shows a specific capacitance of 15 F g^{-1} and

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Research

Chrysopogon shrirangii sp. nov. (Poaceae: Andropogoneae) from Karnataka, India

Shaikh Tarbej, Pooja Mane and Girish Potdar

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Chrysopogon shrirangii, a new species of *Chrysopogon* Trin. (Poaceae) is described and illustrated from the Belgaum district of Karnataka, India. It is similar to *Chrysopogon fulvus* (Spreng.) Chiov. and *C. serrulatus* Trin. but differs by having shorter culm, very narrow (0.8–1.2 mm wide), conduplicate, ensiform, adaxially puberulous, acuminate leaves, shorter panicle, shorter sessile and pedicelled spikelets, and lower glume of sessile spikelet with prominent 4 nerves in two pairs.

Keywords: *Chrysopogon shrirangii*, Karnataka, new species, Poaceae

Introduction

The genus *Chrysopogon* Trin. belongs to the tribe Andropogoneae of Poaceae (Trinius 1820) and comprises by about 49 species (POWO 2019). It is distributed throughout the tropics and subtropics of the old world (Clayton et al. 2006). In India the genus *Chrysopogon* is represented by 24 species (POWO 2019). Several new species have recently been added, namely *Chrysopogon castaneus* (Veldkamp and Salunkhe 2000), *C. purushothamanii* (Ravi et al. 2000), *C. copei* (Ravi et al. 2001) and *C. narayanii* (Sunil et al. 2017). Up to now, 13 species of *Chrysopogon* have been reported from Karnataka state of India: *Chrysopogon aciculatus*, *C. asper*, *C. fulvus*, *C. gryllus*, *C. hackelii*, *C. lawsonii*, *C. nodulibarbis*, *C. orientalis*, *C. pseudozeylanicus*, *C. serrulatus*, *C. velutinus*, *C. verticillatus*, *C. festucoides* and *C. zizanioides* (DFK 2019). However, during extensive floristic exploration of Karnataka, we came across a hitherto unknown species which is described and illustrated below (Fig. 1).

Chrysopogon shrirangii Tarbej, Pooja & Potdar sp. nov. (Fig. 2)

A species very similar to *Chrysopogon fulvus* (Spreng.) Chiov. and *C. serrulatus* Trin. but differing by having shorter culms, very narrow (0.8–1.2 mm wide), conduplicate, ensiform, adaxially puberulous, acuminate leaves, shorter panicle, shorter sessile and pedicelled spikelets, and lower glume of sessile spikelet with prominent 4 nerves in two pairs (Table 1).

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ENVIROCAT EPZG AS A HETEROGENEOUS CATALYST FOR THE SYNTHESIS OF 3,3-DISUBSTITUTED OXINDOLES

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ABSTRACT

Synthesis of 3,3-Disubstituted Oxindoles was achieved by one-pot multicomponent condensation of isatin, malononitrile and indole in presence of Envirocat EPZ-G as a heterogeneous environmental friendly catalyst. This is an environmentally benign method and reusability of the catalyst is beneficial over the others.

Keywords: Oxindoles, EPZ-G and Enviro Catalyst.

INTRODUCTION

The multicomponent protocol has great applicability as an environmentally benign synthesis. It has minimization of steps, atom economy, high yield, minimization of waste, cost-effective natural availability, high thermal stability and reusability.[1-9] In recent years research has started great attention towards the development of multicomponent organic synthesis by using inorganic material[10]. EPZ-G is one of the versatile inorganic materials that act as an enviro catalyst with heterogeneous and acidic properties owing to the properties EPZG as Lewis acid[11] reported in the different transformations such as synthesis of nitro olefins[12], silylation of alcohols[13], methoxylation of alcohols[14], aldoximes to nitriles[15], and Tosylhydrazonea[16].In this protocol, we have reported a method of 3,3-Disubstituted Oxindoles synthesis using EPZG catalyst as an environmentally benign protocol.

It involves Knoevenagel condensation followed by Michael addition. Many reports have shown that Knoevenagel condensation of aldehyde or ketone with malononitrile was catalyzed by the base, but recently $ZnCl_2$[17], Bismuth Nitrate[18] and Maxican bentonitrile[19] EPZ-G[20] were successfully used as an acid catalyst. This prompted as to develop a new strategy of synthesis of 3,3-Disubstituted Oxindoles by Knoevenagel condensation followed by Michael addition.

3,3-Disubstituted Oxindoles is biologically active compounds[21-25] present in many natural products[26-29]Most of the biologically active compounds[30-31] have based on indole skeleton.3,3-Disubstituted Oxindoles carry quaternary carbon atom and multiple functional groups that are strong intermediate which helps during the preparation of biologically active compounds[32] such as anti-HIV[33], anti-tumor[34-37], anti-malarial[38], anti-microbial[39], anti-tubercular[40-41], and antimalarial.[42] To capture these opportunities chemists play a great role in developing of green synthesis of 3,3-Disubstituted Oxindoles.[43-48]

EXPERIMENTAL

Various substituted isatin and Isatin derivatives (Sigma-Aldrich), malononitrile ((Sigma-Aldrich), indole and its derivatives (Himedia) were uses as received without purification. IR spectra were recorded on FT-IR -7600 Lambda Scientific Spectrometer. NMR spectra were recorded on a Bruker AC 400 MHz spectrometer in DMSO D_6 using tetramethylsilane as an internal standard material.

General Procedure

In a 25ml round, bottom flask mixture of isatin (1mmol), malononitrile (1mmol), indole (1mmol) and 30mg EPZG catalyst was refluxed in 5mL water: ethanol (v/v 70:30) solvent system at about 80^0C for the desired

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LETTER ARTICLE

Stereospecific Synthesis of (4E,10Z)- 4,10-Tetradecadienyl Acetate, the Major Sex Pheromone of Apple Leaf Miner Moth, *Phyllonorycter ringoniella*

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Abstract: The main component of the sex pheromone of many lepidopteran pests, (4E,10Z)-4,10-tetradecadienyl acetate (1) has been synthesized stereoselectively by using a simple route with 4-pentynol as a starting material. The stereoselective formation of the 4E double bond is based on the stereospecific reduction of internal alkyne with lithium aluminium hydride (LAH) while Wittig reaction was used to achieve 10Z double bond in the target pheromone component. The GC purity of the final acetate was achieved 97.87% while isomeric purities are more than 99%. The green chemistry principle shows a new concept towards the multistep pheromone synthesis *via* green metrics calculations.

Keywords: Stereoselective synthesis, Apple leaf miner, *Phyllonorycter ringoniella*, Wittig olefination, Reduction, Gram scale synthesis, Green metrics calculations.

1. INTRODUCTION

An apple is one of the most widely cultivated fruit trees, which originated from central Asia and Europe and all around the world. An apple is regularly consumed because of its nutritional contents and rich phytochemicals; it has become an important fruit in the human diet. An apple is full of antioxidants, anti-proliferative and cell signaling effects. The consumption of an apple and apple juice/products may reduce the risk of chronic diseases. Also, beneficial effects on risks of Alzheimer's disease, asthma, cancer, as well as, cardiovascular diseases and diabetes [1,2]. All around the world, the apple orchards are mostly infested by various insect pests like apple leafminer moth (Phyllonorycter ringoniella), codling moth (*Cydia pomonella*), light brown apple moth (*Epiphyas postvittana*) and tufted apple bud moth (*Platynota idaeusalis* (Walker). The apple leafminer, *Phyllonorycter (Lithocolletis) ringoniella* Matsumura (Lepidoptera: Gracillariidae), is an important insect pest on apple trees and has four to six generations a year in Korea, Japan, and China [3,4]. The infestation of this insect generally has shown on narrow host fruit trees to some of the pomes and stone fruits such as apple, cherry, peach, pear, and plum. Ever since 1990s, the outbreak of infestation caused by *P. ringoniella* has been widely observed in some outbreak years to be more than 80% leaf damage into the major apple-growing regions in China [5]. The larvae of *P. ringoniella* mine on the underside of the leaf and also pupate inside it. The early infestations of this insect shows a greenish-white appearance on the upper surface and the irregular shape of silvery-green spots on the lower surface of the leaf [6]. Reduction in the photosynthetic area, inhibits the growth of new buds, defoliation of plants and premature ripening and fruit droppings are the damages caused by the mines done by the larvae of *P. ringoniella* [6,7]. To control the infestation of the apple leaf miner by chemical sprays of insecticides have a limited effect as the larva of *P. ringoniella* is an internal feeder of the leaf and has disadvantages owing to less nutrition. The organic growers all around the world demand non-chemical tactics to reduce the population of the apple leaf miner as well as the other lepidopteran insects. In Integrated Pest management, the use of semiochemical has a great potential in controlling, suppressing or eradicating the insect population by monitoring, mass trapping, mating disruption, lure and kill techniques [8]. In the insect sex pheromones, the (*E,Z*)-diene isomers are well-known, and responsible for special functions and the efficacy for the attraction of moths in the field [9,10]. The synthetic pheromone's efficiency is entirely based on its stereoisomeric purity [11].

The sex pheromone of the apple leaf miner *P. ringoniella* was identified by Ujiye *et al.* (1986) to be a blend of 10-tetradecenyl acetate and a non-conjugated tetradecadienyl acetate, with a double bond in position 10 [12]. The synthesis of the geometrical isomers of the pheromone was carried

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EVALUATION USING *IN-VITRO* ASSAYS FOR GLUCOSE DIFFUSION AND KINETICS OF AMYLOLYSIS OF *LEEA MACROPHYLLA* STANDARDIZED EXTRACTS

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ABSTRACT

The standardized aqueous and methanol extracts of *Leea macrophylla* were studied for their effects on assay of diffusion glucose and for kinetics of amylolysis using *in vitro* models.

The results verified the antidiabetic potential of the standardized aqueous and methanol extract of *Leea macrophylla*.

Keywords: *Leea macrophylla*; glucose diffusion; amylolysis kinetics

INTRODUCTION

Leea macrophylla (Roxb.), of Leeaceae family, an herbaceous shrub with big sized leaf similar to a elephant ear. Ethnobotanical survey shows some important therapeutic uses in cancer, dysentery, body-ache, and sexual disability **[1]**. It is traditionally used for nephrolithiasis, rheumatism, arthritis, pain, tonsillitis, tetanus, snake bites, sore and blood effusion **[2, 3]**. Leaf juice is used for local anti-inflammatory effects, it is also used to treat

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Nanostructured CdO–ZnO composite thin films for sensing application

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ABSTRACT

CdO–ZnO nanocomposites were synthesized by the facile SILAR method. In synthesis, 0.1 M Cd $(NO_3)_2$ and 0.1 M Zn $(NO_3)_2$ were used as sources of Cadmium and Zinc ions, respectively. The supersaturated solutions of Cd and Zn ions served as a cationic bath while 0.075 M NaOH as an anionic bath. To synthesize composite samples, the number of dipping is varied as 1:1, 1:2, and 1:3 concerning (CdO–ZnO). The XRD patterns of composite samples exhibit distinct peaks of ZnO and CdO, which clearly indicates the formation of CdO–ZnO nanocomposites in thin film form. The FE-SEM shows interlocked sheets with a thickness varies from ~ 30 nm to 300 nm for composites. EDAX mapping and XPS study, confirms that the obtained nanocomposite is actually composed of CdO and ZnO. The gas sensing behavior of CdO–ZnO is systematically investigated for 4 test gases under different operating temperatures and different gas concentrations. The maximum response of 52.04% is obtained for 24 ppm of Ethanol at a minimum operating temperature of 325 °C.

1 Introduction

Currently, a great deal of research is concentrated on the development of gas sensors for monitoring and detection of toxic gases. Numerous materials have been investigated for gas sensor applications. The development of fast and sensitive gas sensors with small cross-sensitivity is the subject of intense research in the field of nanoscience and nanotechnology. However, developments in nanotechnology create a window for the synthesis of unique classes of nanostructured materials with enhanced gas sensing properties. The metal oxide semiconductors are attracted significant interest in the industrial and

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Conversion of biogas to methanol by methanotrophs immobilized on chemically modified chitosan

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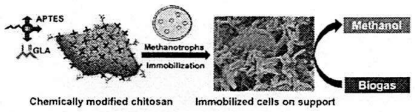
GRAPHICAL ABSTRACT



ARTICLE INFO

Keywords:
Chitosan
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Immobilization
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ABSTRACT

In this study, chitosan modified with glutaraldehyde (GLA), 3-aminopropyltriethoxysilane (APTES), polyethyleneimine, and APTES followed by GLA (APTES-GLA) as a support material was used to improve methanol production from biogas. Among these support materials, chitosan-APTES-GLA showed the highest increase in immobilization yield and relative efficiency of *Methylomicrobium album* up to 56.4% and 97.7%, respectively. Maximum cell loading of 236 mg dry cell mass per g-support was observed for *M. album.*, which is 7.7-fold higher than that of chitosan. The immobilized *M. album* maintained a 23.9-fold higher methanol production compared to free cells after 8 cycles of reuse; it also produced 6.92 mmol·L^{-1} methanol from biogas that originated from anaerobic digestion of rice straw, thereby validating its industrial application. This is the first report on the immobilization of methanotrophs on chemically modified chitosans to improve cell loading and relative efficiency, and its potential applications in the conversion of greenhouse gases to methanol.

1. Introduction

Greenhouse gases (GHGs) are a major threat to the global environment (Cantera et al., 2018; Hazeena et al., 2020). Methane (CH_4), a potent GHG, is abundantly available in the form of natural gas and as a renewable biogas (AlSayed et al., 2018). An increase in anthropogenic activities has led to the rise of CH_4 emission to ~774 teragrams per year (Strong et al., 2016). More than 68,000 trillion cubic feet of CH_4 is globally reserved, contributing to more than 20-times higher global warming than carbon dioxide (CO_2) (Fei et al., 2014; Patel et al., 2016a). It is largely produced during cooking, heating, electricity generation, and combustion of fuel. The large scale use of CH_4 is challenging owing to its low energy density (~0.7 kg·m^{-3}), high cost of transportation, and the lack of basic infrastructure for thermochemical conversion technologies such as Fischer-Tropsch process, which requires a high capital cost for large-scale setup (> $20 billion·facility^{-1}) (Fei et al., 2014; Stone et al., 2017). Therefore, various approaches are being taken into consideration for the biological conversion of CH_4 to chemicals such as methanol, which have a density that is more than 400-times higher than that of CH_4 (Fei et al., 2014; Su et al., 2019). Generation of biofuels using biomass is a potential strategy to overcome the environmental problems associated with waste management as well as fossil fuels (Kapoor et al., 2020; Liu et al., 2018; Srivastava et al., 2019). Moreover, the emissions of GHGs, such as CH_4 and CO_2, can be potentially managed by their utilization through the methanotrophs or pertinent chemical processes to produce value-added products, including biofuels (Fei et al., 2014; Ghosh et al., 2019).

Methanotrophic bacteria have the ability to metabolize CH_4,

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