Bharati Vidyapeeth's

Dr. Patangrao Kadam Mahavidyalaya, Sangli

IPR Cell Activity Report

Date: 4th-Dec-2021

'IPR Cell' of Dr. Patangrao Kadam Mahavidyalaya Sangli, Maharashtra, India organized an online webinar on 'Indian Patent Filing Process with special focus on data requirements for drafting patent specification.' The webinar was organized on Saturday 4th December 2021. The speaker for the eventwas Adv. Parag More, senior Patent and Trademark Attorney, Mumbai. The webinar was chaired by Dr. D. G. Kanase, Principal, Dr. Patangrao Kadam Mahavidyalaya, Sangli, Maharashtra, India. The event was graced by 222 registered international and national participants.

International Participants were from 'Hochschule Fiir Technik und Wirtschaft University, Berlin Germany, 'Here Technologies Berlin, Germany, Hanyang University Seoul, South Korea, Alten Technology, UK, Shandong University of Science and Technology, China, Sejong University, Seoul, South Korea and Durham College, Oshawa Canada.

National Participants were from Gujarat, Maharashtra, Karnataka, Tamil Nadu, Telangana and Chhattisgarh. Faculty of Life Sciences, Medical, Engineering, Pharmacy and Industrial Sector represented the webinar.

Also the 'IPR Cell' extended help for filing and hearing of faculty patents. As a result faculty membersawarded with 03 granted patents and 02 filed patents.

(Dr. Bharat Ballal)
Convener, IPR

(Dr. D. G. Kanase)
PRINCIPAL,
Dr. Patangrao Kadam Mahavidyalaya,
Sangli - 416416 (Sangliwadi)

Founder

Dr. Patangrao Kadam

M. A., L. L. B., Ph. D.

Principal

Dr. D. G. Kanase

M. Sc., Ph. D.

Bharati Vidyapeeth's

Dr. Patangrao Kadam Mahavidyalaya, Sangli

(Arts, Science & Commerce)

Affiliated to Shivaji University, Kolhapur.
'B++' Grade Re-Accredited by NAAC, Banglore (CGPA 2.96)

P. O. Box No. 74, Sangli- 416416. Phone: (0233) (O) 25352229, Tele. Fax.- 2535993
Email:-bvpkc_sangli@yahoo.co.in; Website: http://dpkmsangli.bharatividyapeeth.edu

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Number of Ph.D. Scholar registered per eligible teacher.

Sr. No .	Name of the Ph.D. Scholar	Name of the Department	Name of the Guide	Year of registration of the Scholar
1	Tikare Rina Ramprasad	Chemistry	Dr. D. G. Kanase	2014
2	Patil Kajal Shivaji	Chemistry	Dr. D. G. Kanase	2021
3	Ankalgi Shailesh Shankar	Chemistry	Dr. D. G. Kanase	2021
4	Shelake Abhijit Shrimant	Chemistry	Dr. D. G. Kanase	2021
5	Mujawar Mehejibin Rafig	Chemistry	Dr. A. M. Sargar	2020
6	Mali Vidya Chandrashekar	Chemistry	Dr. A. M. Sargar	2020
7	Ingale Asmita Anandarao	Chemistry	Dr. A. M. Sargar	2021
8	Kadam Pallavi Sambhaji	Chemistry	Dr. A. R. Supale	2020
9	Burud Mahesh Dileep	Chemistry	Dr. A. R. Supale	2022
10	Parakhe Samadhan Popat	Geography	Dr. N. V. Gaikwad	2020
11	Jadhav Dashrath Changdeo	Geography	Dr. N. V. Gaikwad	2020
12	Ninad Ambadas Kadam	Microbiology	Dr. (Mrs) J. V. Kurhekar	2013
13	SutarVinayakPandurang	Microbiology	Dr. (Mrs) J. V. Kurhekar	2014
14	Jadhav Snehalata Jyyavantrao	Microbiology	Dr. (Mrs) J. V. Kurhekar	2014
15	Mane Birudev Sukhdev	Microbiology	Dr. (Mrs) J. V. Kurhekar	2014
16	Shaikh Runalela	Microbiology	Dr. (Mrs) J. V. Kurhekar	2014

Sr. No.	Name of the Ph.D. Scholar	Name of the Department	Name of the Guide	Year of Award
1	Patil Nilam Sarjerao	Microbiology	Dr. Mrs J. V. Kurhekar	2022

(Dr. D. G. Kanase)

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RESEARCH ARTICLE

Applied Polymer SCIENCE WILEY

Role of aromatic ring spacer in homo-coupled conjugated microporous polymers in selective CO_2 separation

Sachin Tanaji Mane[1] | D. G. Kanase[1] | Suhas Mohite[2]

[1]Department of Chemistry, Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli, Maharashtra, India

[2]Department of Chemistry, Bharati Vidyapeeth Deemed University, Yashwantrao Mohite College, Pune, Maharashtra, India

Correspondence
Sachin Tanaji Mane, Department of Chemistry, Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli, Maharashtra 416416, India.
Email: stm2011.mane@gmail.com.

Abstract

To obtain high purity of natural and flue gases, the development of adsorbent with appropriate structure is of great importance. As a result, there is an urgent need to investigate the role of aromatic ring spacer in adsorbent in high CO_2 capture. For this, conjugated microporous polymers (CMPs) were fabricated through homo-coupling reaction of 1,3,5-tribromobenzene (TBB) and 1,3,5-triethynylbenzene (TEB). It was observed that, CMP-A (without spacer) demonstrates high CO_2 uptake over CMP-B (with spacer). CMP-A demonstrates CO_2 uptake of 212.1 mg g^{-1} which is obviously higher than benchmark adsorbents under the analogous conditions. In addition, the obtained CO_2 uptake is also higher than metal–organic framework (MOF) and energy-intensive carbon-based adsorbents. CMP-A revealed high CO_2/N_2 selectivity (78.5) over CMP-B (56.1). It was noticed that CMP-A demonstrates excellent CO_2/CH_4 and CO_2/N_2 selectivity over CMP-B at 273 K. This is mainly due to appropriate structure in CMP-A (without spacer). The obtained CO_2/N_2 selectivity (78.5) is higher than recently reported adsorbents under the similar experimental conditions.

KEYWORDS

CO_2 capture, conjugated polymers, homo-coupled polymers, microporous polymers

1 | INTRODUCTION

Today, natural and flue gases are the major sources of clean energy. Indeed, raw natural and flue gas mainly consists of methane and nitrogen, respectively along with CO_2 as a major impurity. To obtain enhanced calorific value of natural and flue gas, selective removal of CO_2 is an essential. Till date, different functional sorbents were developed for selective CO_2 separation. The primary advantage of functional sorbents is the high CO_2 selectivity in comparison with non-functional carbon-based sorbents.[1] To improve the selectivity of CO_2 over CH_4 and N_2, incorporation of the polar functional groups such as –OH, –NH–, –S–, –O–, and –F are well-known strategy.[2,3] On the one hand, these polar functional groups obviously enhance the interaction of sorbent and acidic CO_2 over CH_4 and N_2. On the other hand, polar functional sorbents also enhance affinity for atmospheric moisture which results into decreased CO_2 uptake.[4,5] Moreover, porous polymer network-6 (PPN-6) after tethering with alkylamines exhibited a high isosteric heat of adsorption (Q_{st}), with a value up to 60 kJ mol^{-1} contributes to chemisorption which results into energy-intensive regeneration of adsorbent.[6] Thus, functional sorbents have the drawbacks of low adsorption capacity and high heat of adsorption. Therefore, development of carbon based porous sorbents is needed for high CO_2 uptake and energy-saving regeneration.

Recently, there is potential development of solid sorbents for selective CO_2 capture.[7] Porous sorbents such as zeolites, activated carbons, and metal–organic frameworks

Recent Developments in Chiral Stationary Phases: A Mini-Review

Sachin Tanaji Mane[1]*, Dhanaji Govindrao Kanase[1]

[1]*Department of Chemistry, Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli-416416, Maharashtra, India.*

ABSTRACT

The purification of racemic drugs into enantiopure drugs is an extreme demand of the pharmaceutical industry. In racemic drugs, two or more enantiomers are often present. In these isomers, one isomer may be pharmacologically active whereas another isomer(s) may be inactive or in teratogenic (toxic) form. The resolution of pharmacologically active isomer from inactive or teratogenic isomer is an extreme need. As a result, the development of resolution techniques to obtain the enantiopure drug is very essential to treat the disease. In the present review, recent developments of different chiral stationary phases (CSPs) such as pirkle, polysaccharides and polypeptides, inclusion, ligand-exchange, macrocyclic antibiotics, and miscellaneous CSPs in a resolution of racemic drugs/mixtures are discussed. The progress of these CSPs in high performance liquid chromatography (HPLC), gas chromatography (GC), capillary electrophoresis (CE), supercritical fluid chromatography (SFC), and simulated moving bed (SMB) chromatography is discussed. Different interactions between CSPs and analytes which attributes for resolution of racemic drugs are also discussed.

Key Words: *Racemates, Racemic drugs, Chiral separation, Enantiopurification, Chiral stationary phases*

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INTRODUCTION

The mixture of two or more enantiomers wherein one enantiomer may be pharmacologically active and another enantiomer(s) may be equal/less potent, inactive, or toxic can be referred to as a Racemate. Over the past few decades, drugs were used in the form of a racemate to treat the diseases. The thalidomide tragedy first time underlined the importance of drug resolution [1]. In this tragedy, due to the presence of toxic isomer along with pharmacological isomer, 10000 children were born with phocomelia congenital disorder. Indeed, each enantiomer in the racemate is selective toward the pharmacological effect. Therefore, the resolution of racemates into enantiopure drugs by different resolution techniques is important and is a demand in organic and pharmaceutical chemistry [2]. The significance of chirality in drug design and development is discussed in the literature [3].

In some cases, synthesis of enantiopure molecules is not possible since enantiopurity of the product depends on regio-, chemo- and stereo-selectivity of the chiral catalysts, reagents, substrates, or other chiral entities [4-12]. Therefore, synthesis of the racemate and subsequent resolution is needed. Different methods such as chiral catalysis, chiral pool, chiral reagent, asymmetric synthesis (chiral substrate and chiral auxiliary) [7-11], crystallization [13], and resolution (direct and indirect) are the ways to obtain enantiopure molecules [14, 15]. The optical purity of enantiopure molecules can be determined by an enantiomeric excess which can be examined by different analytical techniques such as chromatographic, spectroscopic, light, and thermal methods. The analytical techniques such as gas chromatography (GC) [16], supercritical fluid chromatography (SFC) [17], simulated moving bed (SMB) chromatography [18], high performance liquid chromatography (HPLC) [19], capillary electrophoresis (CE) [20], thin layer chromatography (TLC) [21], nuclear magnetic resonance (NMR) [22], circular dichroism (CD) [23], X-ray diffraction [24], isotopic dilution (ID) [25], differential scanning calorimetry (DSC) [26], polarimetry [27], and some miscellaneous methods [28] are available for optical purity (enantiomeric excess) determination. Some of them are useful for analytical (qualitative) purposes and some

Corresponding author: Sachin Tanaji Mane
Address: Department of Chemistry, Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli-416416, Maharashtra, India.
E-mail: stm2011.mane@gmail.com
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Influence of Zn-substitution on structural, morphological, electrical, and gas sensing properties of $Zn_xAl_2O_4$ ($x = 0.1$ to 0.5) synthesized by a sol-gel auto-combustion method

Rina R. Tikare [a], Rohit R. Powar [b,*], Vinayak G. Parale [c], Hyung-Ho Park [c], Tukaram J. Shinde [d], Dhanaji G. Kanase [a,**]

[a] Metal Oxide Research Laboratory, Dr. Patangrao Kadam Mahavidyalaya, Sangli, 416416, Maharashtra, India
[b] Department of Chemistry, Shahid Virpatni Laxmi Mahavidyalaya, Titave, 416208, Maharashtra, India
[c] Department of Materials Science and Engineering, Yonsei University, Seoul, 03722, Republic of Korea
[d] P. G. Department of Physics, Smt. K.R.P. Kanya Mahavidyalaya, Islampur, 415409, Maharashtra, India

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ABSTRACT

The nanosphere decorated needle-like morphology of zinc-substituted aluminate having general formula $Zn_xAl_2O_4$ ($x = 0.1$, 0.2, 0.3, 0.4, and 0.5) (ZAN) samples were synthesized by a sol-gel auto-combustion method. The phase formation and stability temperature were confirmed by TG-DTA analysis. XRD study confirmed the formation of a cubic spinel structure of ZAN samples. The effect of Zn-substitution on structural and morphological properties of aluminate were investigated using X-ray diffraction (XRD), Fourier transforms infrared spectroscopy (FTIR), Transmission electron microscopy (TEM), Field emission scanning electron microscopy (FESEM), and Energy dispersive X-ray analysis (EDAX). The D.C. electrical resistivity study of ZAN samples revealed that resistance decreased with increasing temperature confirmed semiconducting nature. Nanosphere existing on micro-needles of zinc-substituted aluminate gas sensor revealed sensing to several analyte gases such as H_2S, Cl_2, CH_3OH, SO_2, and NO_2 working at room temperature to 300 °C. The $Zn_{0.4}Al_2O_4$ compositional gas sensor produced the highest response at operating temperature 200 °C to 100 ppm H_2S. The results revealed that the prepared nanosphere decorated needles of the ZAN sensor was sensitive and selective to H_2S gas.

1. Introduction

At present, owing to protection and environmental control criteria, gas sensors have received excellent attention. The air pollution has now been tremendously intensified due to the rapid industrialization and an enormous amount of vehicle produced contaminants such as gases, volatile organic compounds (VOCs), suspended particulate matter (SPM), etc. Some oxidizing or reducing gases or vapors such as CO_2, Cl_2, NO_2, and ammonia are found to be harmful and cause allergic and breathing diseases like rhinitis and bronchial asthma [1]. Particularly air pollution was enormously hazardous as it is associated with the respiratory system. Generally, contaminated surrounding contains harmful, dangerous, or toxic gases adversely affected human health. Thus air pollution became a major issue due to stringent surrounding or safety guidelines all over nations. Hopefully, the researchers willing to evaluate the ability to manufacture reactive material that is simple and low-cost to track air pollution at their sources. Hydrogen sulfide (H_2S) is a colorless, slightly heavier than air, combustible gas, and very cruel with a typical foul odor of rotten egg [1,2]. H_2S gas is one of the highly toxic gases emitted by various industrial effluent treatment plants, oil refineries, oil and gas drilling plants, Kraft paper mills, tanneries, thermal power plants, etc. [3]. To minimize health hazards and eruption tragedies, H_2S gas must be identified at (ppm/ppb) trace level for personal health protection to unnecessary exposure of the H_2S gas climate. The respiratory tract diseases occurred in employees due to intense exposure to H_2S gas. At concentrations ranging from 10 to 500 ppm of H_2S gas, the National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) decide criteria for adverse health effects due to exposure [1,4].

* Corresponding author.
** Corresponding author.
E-mail addresses: rohitpowar009@gmail.com (R.R. Powar), dgkanase@gmail.com (D.G. Kanase).

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Monitoring and Assessment of Water Quality using Multivariate Statistics of Physico-chemical Parameters to establish Baseline Level around proposed Jaitapur Nuclear Power Plant (JNPP), India

Shinde R.D.[1], Burungale S.H.[2], Supale A.R.[3], Chikode P.P.[1] and Sabale S.R.[1]*
1. Jaysingpur College, Jaysingpur-416101, Maharashtra, INDIA
2. Yashwantrao Chavan College of Science, Karad-415124, Maharashtra, INDIA
3. Dr. P. K. Mahavidyalaya, Sangli-416416, Maharashtra, INDIA
*srsabale@gmail.com

Abstract

This study illustrates the usefulness of multivariate statistical techniques to provide straightforward data interpretation as well as valuable insights of datasets to get better information about the water quality and helps to design monitoring networks for effective management of available water resources. In this study, Multivariate statistical analysis, Cluster analysis, Principal Component Analysis, Factor Analysis, Water Quality Index and Piper diagram are used to analyze the water data and to prepare the baseline of water parameters around the proposed JNPP. Piper diagram indicates that the primary salinity ("non-carbonate alkali") exceeds 50 % which means that the chemical properties of water are dominated by alkalies and strong acids. Water quality indices indicate that water is non-polluted and fully fit for drinking purposes.

Principal component analysis and factor analysis applied for water parameters point towards the common source of minerals and high level of dissolved organic matter. Trace metal analysis shows significant but little participation of zinc, copper, nickel, iron and barium in water quality. The baseline developed and the data obtained will be useful for the water quality analysis after post-plant operation in this region.

Keywords: Water, JNPP Region, Physico-chemical parameters, Multivariate Statistics, Baseline.

Introduction

Safe water is a basic human right and pre-condition for health and development, yet it is still denied to millions of people of the developing world. Poor sanitation and hygiene coupled with insufficient safe water cause water-related diseases leading to 3.4 million deaths per year and most of them are children[21,23]. India in 1974 enacted 'The Water Act' for prevention and control of water pollution to maintain and restore purity of water in the country. The act was further amended in 1992 and 2003. Currently, India's environment has become fragile and is of concern because of increasing industrialization, urbanization and growth in population[9]. Water quality expresses the suitability of water to sustain various uses and processes. Every use or process requires certain physical, chemical and biological characteristics of water. Physical and chemical parameters of water are easily defined and hence, criteria set for water quality are largely based on physical and chemical conditions of the water. Biological methods of analyzing water quality are based on a diversity index derived from information theory. These indices express the relative importance of species, also they are dimensionless and independent of the sample size collected.

Once the water gets contaminated, it is difficult to restore its quality. Consequently, directly or indirectly everyone gets affected. Heavy metal contamination is a major problem in several communities and agricultural areas. Commercial agrochemicals, savage water and industrial wastewater are the measured sources of heavy metal contamination[15,16,25]. The contamination in an aquatic community is of major concern because of its toxicity, abundance and persistence in the environment. This may contaminate the aquatic ecosystem or public health[4,22]. Thus the analysis of water quality is important to preserve the environmental system.

The application of basic and multivariate statistical methods including Cluster analysis (CA), Principal Component Analysis (PCA), Factor Analysis (FA) and Water Quality Index (WQI) for the investigation of water quality data are widely found in literature[2,3,8,24,26]. Government has responded to the water findings by implementing required appropriate action plans at diverse locations[6]. Hence it is important to provide the detailed composition of water parameters to help the local environmental policymakers.

Study area

Jaitapur is a small village situated in the Rajapur Tehsil of Ratnagiri District, Maharashtra. It lies on the Arabian Sea coast. Nuclear Power Corporation of India Limited (NPCIL) proposed a Nuclear Power Plant with a 9900 MW capacity near Jaitapur. This project is located at 16.55° N; 73.35° E, a part of Konkan in the Western Ghats of Maharashtra. The issue was highlighted by different non-governmental organizations because of the adverse effects of radiation and different types of pollution. Also, many other industries like thermal power, mining of aluminium etc. are being constructed in this Konkan region. This Konkan region is famous for mango production and export especially

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Green synthesis of magnetite nanoparticles (Fe_3O_4 NPs) using *Acacia concinna* fruit extract and their antibacterial activity

*Shubhangi Mane-Gavade, Arihant Malgave, Gurunath Nikam, Amruta Koli, Amit Supale, and Sandip Sabale**

This paper describes green, simple, and efficient method for the synthesis of magnetite nanoparticles (Fe_3O_4 NPs) using *Acacia concinna* fruit extract for the first time. *A. concinna* fruit extract is used as reducing and stabilizing agent. Reduction of Fe^{3+} ions by *A. concinna* fruit extract is examined by UV-visible absorption spectra (UV-Vis-NIR). To recognize the functional group responsible for Fe_3O_4 the NPs are characterized by Fourier transform infra-red spectroscopy (FTIR). The structural analysis of Fe_3O_4 NPs is done by X-ray diffraction (XRD) which confirms cubic spinel structure and the average crystallite size of obtained NPs is found to be 28 nm. The morphological studies of Fe_3O_4 NPs are done by scanning electron microscope (SEM) which depicts the quasi-spherical morphology. The green synthesized Fe_3O_4 NPs shows distinctive antibacterial activities against gram-negative *E. coli* and *Pseudomonas aeruginosa* microorganism which confirms its potential in biomedical applications.

1. Introduction

Magnetic nanoparticles (MNPs) have been attracting much attention because of their probable applications either as photocatalysis, ferro fluid technology, drug delivery, pigment, magnetic storage, magnetic ink printing, microwave absorption, biosensors, bio- separation, and in vivo drug delivery.[1,2] Particularly, magnetite nanoparticles (Fe_3O_4NPs) have attracted enormous interest, due to their unique magnetic properties, high electrical resistivity, and high chemical stability. It is often known that the activity of Fe_3O_4NPs strongly depends on their size, shape, and crystal phase.[3] Generally, the shape has a huge impact on the resulting properties of Fe_3O_4NPsand their potential applications.

These potential applications of Fe_3O_4NPs have inspired the fast development of various synthetic techniques such as co-precipitation, hydrothermal treatment, spray pyrolysis, ultrasound irradiation, microwave-assisted method, and solvothermal method.[4,5] While, most of these methods rely on the use of toxic reducing agents and special equipment which make them less eco-friendly and costly. Hence, there is urgent need to develop environmentally benign methods, where, natural products could be used that are biocompatible, low cost, and easily available and one such method is the green synthesis.[6] It makes use of plant extracts that acts as an efficient reducing and capping agent in Fe_3O_4 NPs synthesis. It is economic and valuable alternative with toxic free approach.[7] Many researchers reported the synthesis of Fe_3O_4NPs using *Artemisia annua*,[8] leaf extract of *Perilla frutescens*,[9] *Tridax procumbens*,[10] and *Caricaya papaya*,[11] peel extract of *plantain*,[12] and also seed extract of grape *proanthocyanidin*.[13] However, no literature reports are available for the syntheses of Fe_3O_4NPsusing aqueous fruit extract of *Acacia concinna*.

In the present work, we report simple green route for the synthesis of magnetite NPs using *A. concinna* fruit extract. The phytochemicals present in *A. concinna* fruit extract are not only responsible for the formation of Fe_3O_4NPs but also act as capping agent for Fe_3O_4NPs. *A. concinna* is relatively large genus of plants belonging to *fabaceae* family [14]. The synthesized Fe_3O_4NPs were characterized using different characterization techniques and tested against pathogenic microorganisms.

2. Result and Discussion

2.1. Morphological and Structural Properties of Fe_3O_4 NPs

Scanning electron microscope (SEM) was used to examine the surface morphology and structure obtained Fe_3O_4NPs. **Figure 1**A shows representative SEM images of Fe_3O_4 NPs produced by *A. concinna* fruit extracts during the biosynthesis reaction. The morphology observed was quasi-spherical and several agglomerates can be appreciated. Various studies describe this agglomeration as a stearic effect caused by the interaction of the active sites of the

S. Mane-Gavade, A. Malgave, G. Nikam, A. Koli, S. Sabale
P. G. Department of Chemistry
Jaysingpur College
Jaysingpur, Maharashtra 416101, India
E-mail: srsabale@gmail.com

A. Supale
P. G. Department of Chemistry
Patangrao Kadam Mahavidyalaya
Sangli, Maharashtra 416416, India

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EDITORIAL

BENTHAM SCIENCE

Role of Nutrition in COVID-19: Present Knowledge and Future Guidelines

Maruti Jayram Dhanavade[1,*] and Kailas Dashrath Sonawane[2,3,*]

[1]*Department of Microbiology, Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli 416416, Maharashtra, India;* [2]*Department of Biochemistry, Shivaji University, Kolhapur, Maharashtra 416004, India;* [3]*Department of Microbiology, Shivaji University, Kolhapur, Maharashtra 416004, India*

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COVID-19 pandemic has become a serious threat to human beings, which is badly affecting the lives of mankind. The causative agent of COVID-19 is a novel coronavirus (SARS-CoV-2) that causes severe acute respiratory syndrome. The COVID-19 infection has been transmitted from animals to humans, and now it has spread astoundingly worldwide. In a severe case of COVID-19 disease, atypical pneumonia leads to the death of a diseased person. Some risk factors associated with COVID-19 include older age, smoking, cardiovascular disease (CD), obesity, respiratory diseases (RD), and a higher Sequential Organ Failure Assessment score. Due to the unavailability of effective drugs against COVID-19, people have been forced to implement strict regulations, including social distancing and lockdown. These restrictions have affected human populations in various aspects, *viz.*, psychological, social, economic, *etc*. Although few vaccines have been developed, such as covishield, sputnik, and covaxin, *etc.*, still the question remains about their efficacy and how to prevent re-infection among fully vaccinated people. However, several reports suggested that fully vaccinated individuals also get infected by mutated strains of SARS-CoV-2, and developing disease with less severity [1]. Few drugs like chloroquine, hydroxychloroquine, favipiravir, nafamostat camostat, remdesivir, *etc.*, were used for COVID-19 treatment, but still, these drugs could not be the final solution against COVID-19 [2].

Structural bioinformatics studies would play an essential role in understanding the basic mechanism behind using few specific drug in COVID-19 [3]. However, we are still unaware about the exact role of nutrition and its modulation on the epidemiology of COVID-19 disease. Hence, in the present context, the evaluation of the relation between nutrition and the COVID-19 pandemic has been done. While searching the solution to COVID-19, it has been suggested that the nutritional status of an individual may alter the immune system positively or negatively; hence it has a big role to play in the modulation of SARS-CoV-2 infection [4].

Due to the lockdown during COVID-19, the eating habits of people have changed, which has led to the weakening of the immune system, and because of that, people may suffer from chronic disease in the future [5]. A balanced diet can boost the immune system, which will help to fight against many types of infections, including SARS-CoV-2, and live a healthy life. Another major aspect that is being ignored during this COVID-19 pandemic is that due to strict regulations, people have been quarantined to protect themselves from SARS-CoV-2 infection. This has changed the eating habits and daily routine of people, which could result in increased energy intake by consuming large amounts of fats, carbohydrates, and proteins. This high energy intake could have serious effects on some disease conditions like diabetes, heart disease, kidney disease, as well as COVID-19. Hence, there is an urge to shift our focus towards food intake that will play a significant role in keeping us healthy and functioning normally [6]. It has been strongly proposed that reduced obesity could be very helpful to minimize the chances of type 2 diabetes as well as severe COVID-19 disease [7]. Vitamin C is one of the best nutrients which can help to improve the immune system of an individual [8]. The change in nutrient supplements and their effects on the immune system in different age groups must be well understood during and after COVID-19 [9]. Importantly, it has been directed that minerals, vitamins C, A, D, and zinc play crucial roles in boosting the immune system during COVID-19. In viral, bacterial, fungal, and parasitic infections, the host's immune system is important for the protection and fight against these pathogens. The quick action of the immune system against foreign enemies can increase the metabolic rate; hence there is a requirement of good energy sources for the biosynthesis of regulatory molecules. In such circumstances, vitamins such as folate, A, B6, B12, C, D, and E, as well as trace minerals such as copper, iron, selenium, and zinc, have been found to play important roles in supporting the immune system and reducing infection risks. All these nutrients could play important role in supporting the antiviral and antibacterial defence system. Similarly, the gut microbiota could also be critical for regulating the host immune system [9, 10].

The plant-based food materials have been found to enhance the immunity against COVID-19 in all age groups [11]. Several plant-based food items have been shown to boost intestinal beneficial bacteria, which contributes to an immune system that is

*Address correspondence to these authors at the Department of Microbiology, Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli 416416, Maharashtra, India; Tell: +917071861212; E-mail: marutijd@gmail.com
Department of Biochemistry, Shivaji University Kolhapur, Maharashtra 416004, India; Tell: +919881320719; E-mail: kds_biochem@unishivaji.ac.in

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Structural significance of Neprylysin from *Streptococcus suis GZ1* in the degradation of Aβ peptides, a causative agent in Alzheimer's disease

Subodh Kamble [a], Sagar Barale [b], Maruti Dhanavade [c], Kailas Sonawane [a,b,*]

[a] Structural Bioinformatics Unit, Department of Biochemistry, Shivaji University, Kolhapur, 416004, M.S., India
[b] Department of Microbiology, Shivaji University, Kolhapur, 416004, M.S., India
[c] Department of Microbiology, Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya Sangli, Pin-416416, India

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ABSTRACT

Alzheimer's disease (AD) is a progressive brain disorder. The accumulation of amyloid beta (Aβ) peptides in the human brain leads to AD. The cleavage of Aβ peptides by several enzymes is being considered as an essential aspect in the treatment of AD. Neprilysin (NEP) is an important enzyme that clears the Aβ plaques in the human brain. The human NEP activity has been found reduced due to mutations in NEP and the presence of inhibitors. However, the role of NEP in the degradation of Aβ peptides in detail at the molecular level is not yet clear. Hence, in the present study, we have investigated the structural significance of NEP from the bacterial source *Streptococcus suis GZ1* using various bioinformatics approaches. The homology modelling technique was used to predict the three-dimensional structure of NEP. Further, molecular dynamic (MD) simulated model of NEP was docked with Aβ peptide. Analysis of MD simulated docked complex showed that the wild-type NEP-Aβ-peptide complex is more stable as compared to mutant complex. Hydrogen bonding interactions between NEP with $Zn^{2+}$and Aβ peptide confirm the degradation of the Aβ peptide. The molecular docking and MD simulation results revealed that the active site residue Glu-538 of bacterial NEP along with Zn^{2+} interact with His-13 of Aβ peptide. This stable interaction confirms the involvement of NEP with Glu-538 in the degradation of the Aβ peptide. The other residues such as Glu203, Ser537, Gly140, Val587, and Val536 could also play an important role in the cleavage of Aβ peptide in between Asp1-Ala2, Arg5-His6, Val18-Phe19, Gly9-Tyr10, and Arg5-His6. Hence, the predicted model of the NEP enzyme of *Streptococcus suis GZ1*could be useful to understand the Aβ peptide degradation in detail at the molecular level. The information obtained from this study would be helpful in designing new lead molecules for the effective treatment of AD.

1. Introduction

Alzheimer's disease (AD) is a progressive neurodegenerative disorder that causes an irreversible and gradual decline of memory, language skills, perception of time and space, and the ability to care for oneself. Amyloid plaque formation is a pathological hallmark in AD [1,2]. The $A\beta_{1-40}$ and $A\beta_{1-42}$ peptides are the main constituents of amyloid plaques in AD [3–5]. The familial autosomal dominant (FAD) mutations and improper proteolytic degradation increases $A\beta_{1-42}$ and $A\beta_{1-40}$ peptides deposition in the brain [6]. In the human brain, the formation of Aβ peptide is a continuous process, and it is estimated to have a physiological production rate of 7.6% per hour [7]. The enzymes such as Insulin Degrading Enzyme (IDE), Human Endothelin Converting Enzymes (hECE), Angiotensin Converting Enzyme (ACE), Cathepsin B, Cathepsin D, and Neprilysin (NEP) present in the human brain are known to play an important role in Aβ peptide clearance [8–12]. Similarly, in a recent review role of amyloid beta peptide-degrading microbial enzymes and their implication in drug designing has been discussed [13].

The NEP is also known as neutral endopeptidase-24.11 (E. C.3.4.24.11), Enkephalinase, neutrophil cluster-differentiation antigen 10, or common acute lymphoblastic leukemia antigen [14]. The NEP is a 90–110 kDa plasma membrane glycoprotein of the neutral zinc metalloendopeptidase family [15]. In the human brain, NEP is expressed at pre- and post-synaptic membranes and is involved in the regulation of neuropeptide signalling. It is also expressed in the tunica media and endothelium of cortical and leptomeningeal blood vessels, where it is involved in the regulation of vascular tone. *In-vivo* assay with radio labelled Aβ peptide reported the involvement of NEP enzyme in the

* Corresponding author. Structural Bioinformatics Unit, Department of Biochemistry, Shivaji University, Kolhapur, 416 004, Maharashtra (M.S.), India.
E-mail address: kds_biochem@unishivaji.ac.in (K. Sonawane).

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Article

Modifying Thermostability and Reusability of Hyperthermophilic Mannanase by Immobilization on Glutaraldehyde Cross-Linked Chitosan Beads

Beenish Sadaqat [1,2], Chong Sha [2], Mudasir Ahmad Dar [2], Maruti J. Dhanavade [3], Kailas D. Sonawane [4], Hassan Mohamed [1,5], Weilan Shao [2,*] and Yuanda Song [1,*]

1. Colin Ratledge Center for Microbial Lipids, School of Agriculture Engineering and Food Science, Shandong University of Technology, Zibo 255049, China; beenish@sdut.edu.cn (B.S.); hassanmohamed85@azhar.edu.eg (H.M.)
2. School of the Environment and Safety Engineering, Biofuels Institute, Jiangsu University, Zhenjiang 212013, China; jnshachong@163.com (C.S.); mudasir.dar@unipune.ac.in (M.A.D.)
3. Department of Microbiology, Bharati Vidyapeeth's Dr Patangrao Kadam Mahavidyalaya College, Sangli 416416, India; marutijd@gmail.com
4. Structural Bioinformatics Unit, Department of Biochemistry, Shivaji University, Kolhapur 416004, India; kds_biochem@unishvaji.ac.in
5. Department of Botany and Microbiology, Faculty of Science, Al-Azhar University, Assiut 71524, Egypt

* Correspondence: weilanshao@foxmail.com (W.S.); ysong@sdut.edu.cn (Y.S.)

Abstract: In the current study, the purified β-mannanase (Man/Cel5B) from *Thermotoga maritima* was immobilized on glutaraldehyde cross-linked chitosan beads. The immobilization of Man/Cel5B on chitosan beads was confirmed by Fourier-transform infrared spectroscopy (FTIR) and X-ray diffraction (XRD) analysis. After immobilization, the protein loading efficiency and immobilization yield were found to be 73.3% and 71.8%, respectively. The optimum pH for both free and immobilized enzymes was found to be pH 5.5. However, the optimum temperature of immobilized Man/Cel5B increased by 10 °C, from 85 °C (free Man/Cel5B) to 95 °C (Immobilized). The half-life of free and immobilized enzymes was found to be 7 h and 9 h, respectively, at 85 °C owing to the higher thermostability of immobilized Man/Cel5B. The increase in thermostability was also demonstrated by an increase in the energy of deactivation (209 kJmol^{-1}) for immobilized enzyme compared to its native form (92 kJmol^{-1}), at 85 °C. Furthermore, the immobilized Man/Cel5B displayed good operational stability as it retained 54% of its original activity after 15 repeated catalytic reactions concerning its free form.

Keywords: β-mannanase; docking; hyperthermostable; kinetics

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1. Introduction

Mannans are an integral part of hemicellulose and are predominantly found in the soft woods, plant endosperms, seeds, and vacuoles of a wide variety of plants [1–3]. Mannans are also present as glycoproteins in the cell walls of some yeasts, fungi, and bacteria [4]. β-1,4-mannanase (mannan mannohydrolase, EC 3.2.1.78) is an endo-acting hydrolase that randomly cleaves the β-1,4-mannosidic linkages in the main chain of mannans (linear mannan, galactomannan, glucomannan, and galactoglucomannan), therefore producing mannooligosaccharides (MOS) of various lengths [5]. β-mannanase has wide industrial applications as it is used for the production of partially hydrolyzed guar gum, MOS, fruit juice clarification, paper/pulp bio-bleaching, synthesis of detergents, amelioration of animal or poultry feed, and saccharification of biomass [6,7].

Despite the versatility of β-mannanase, the use of these enzymes in soluble form at the industrial scale has some limitations including low stability, unmanageable recovery and reuse, short shelf life, difficulty in handling, and loss of activity at prolonged operational

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Exploring bioactive peptides as potential therapeutic and biotechnology treasures: A contemporary perspective

Prasanna J. Patil[a,b], Shubham S. Sutar[c], Muhammad Usman[a,b], Devashree N. Patil[c], Maruti J. Dhanavade[d], Qayyum Shehzad[e], Arshad Mehmood[a,b,f], Haroon Shah[a,b], Chao Teng[a,b,f], Chengnan Zhang[a,b,f,*], Xiuting Li[a,b,f,*]

[a] Beijing Advanced Innovation Center for Food Nutrition and Human Health, Beijing Technology and Business University, Beijing 100048, China
[b] School of Food and Health, Beijing Technology and Business University, No. 11, Fucheng Road, Beijing 100048, China
[c] Department of Biotechnology, Shivaji University, Vidyanagar, Kolhapur, Maharashtra 416004, India
[d] Department of Microbiology, Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli, Maharashtra 416416, India
[e] National Engineering Laboratory for Agri-Product Quality Traceability, Beijing Technology and Business University, Beijing 100048, China
[f] Beijing Engineering and Technology Research Center of Food Additives, School of Food and Chemical Technology, Beijing Technology and Business University, Beijing 100048, China

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ABSTRACT

In preceding years, bioactive peptides (BAPs) have piqued escalating attention owing to their multitudinous biological features. To date, many potential BAPs exhibiting anti-cancer activities have been documented; yet, obstacles such as their safety profiles and consumer acceptance continue to exist. Moreover, BAPs have been discovered to facilitate the suppression of Coronavirus Disease 2019 (CoVID-19) and maybe ideal for treating the CoVID-19 infection, as stated by published experimental findings, but their widespread knowledge is scarce. Likewise, there is a cornucopia of BAPs possessing neuroprotective effects that mend neurodegenerative diseases (NDs) by regulating gut microbiota, but they remain a subject of research interest. Additionally, a plethora of researchers have attempted next-generation approaches based on BAPs, but they need scientific attention. The

Abbreviations: AAs, Amino acids; Aβ, Amyloid β; ACBPs, Anticancer bioactive peptides; AChE, Acetylcholinesterase; AD, Alzheimer's disease; ADNF, Activity-dependent neurotrophic factor; AEGIS-SELEX, Artificially expanded genetic information system-SELEX; AFM-SELEX, Atomic force microscopy-SELEX; Aib, α-Aminoisobutyric acid; AIDS, ACE-2-interacting Domain of SARS-CoV-2; ALS, Amyotrophic lateral sclerosis; AP-1, Activator protein 1; AQ, Aquashine; BAPs, Bioactive peptides; BACE1, Beta-site amyloid precursor protein (APP) cleaving enzyme-1; Bax, B-cell lymphoma protein 2 -associated X; BBB, Blood-brain barrier; BChE, Butyrylcholinesterase; Bcl-2, B-cell lymphoma 2; BCM-7, Betacasomorphin-7; BMP-2, Bone morphogenic protein-2; BR, Brightening; CAS, Catalytic anionic site; Cdk5, Cyclin-dependent kinase 5; CE-SELEX, Capillary electrophoresis-SELEX; CIP, Cdk5 inhibitory peptide; CNT-PLLA, Carbon nanotube-poly-L-lactic acid; CoVID-19, Coronavirus disease 2019; CRF, Corticotrophin-releasing factor; CuAAC, Copper(I)-catalyzed alkyne-azide cycloaddition; OGlcNAc, O-linked N-acetyl-D-glucosamine; cyO8, Cycloviolacin O8; E-PB, Electrochemical peptide-based; EX-4, Exendin-4; FDM, Fused deposition modelling; GAPDH, Glyceraldehyde-3-phosphate dehydrogenase; GLP-1R, Glucagon-like peptide 1 receptor; hACE2, Human angiotensin-converting enzyme 2; HAH, Hyaluronate-alginate hybrid; hCMCs, Human circulating multipotent cells; HD, Huntington's disease; HDMP, Human defensin-6 mimic peptide; hMSCs, Human mesenchymal stem cells; HTT, Huntingtin; IFN-α, Interferon-alpha; IL-6, Interleukin 6; IP-SELEX, Immunoprecipitation-coupled- SELEX; KTN, Keratin; LDH, Lactate dehydrogenase; LTM, Long-term memory; LTP, Long-term potentiation; MB, Methylene blue; MC, Methylcellulose; Mcl-1, Myeloid cell leukemia-1; MERS-CoV, Middle East respiratory syndrome coronavirus; mHTT, Mutant huntingtin; MPP^+, 1-methyl-4-phenylpyridinium; MPTP, 1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine; MTT, 3-(4,5-dimethyl thiazolyl)-2,5-diphenyl-tetrazolium bromide; ND, Neurodegenerative disease; NF-κB, Nuclear factor kappa B; NK, Nattokinase; OBP, Odorant-binding protein; OGP, Osteogenic growth peptide; PA, Peptide amphiphile; PAC1, Pituitary adenylate cyclase-activating polypeptide type I receptor; PARP, Poly (ADP-ribose) polymerase; PCNA, Proliferating cell nuclear antigen; PD, Parkinson's disease; PEG, Polyethylene glycol; PEGDA, Polyethylene glycol diacrylate; PEU, Poly(ester urea); pI, Isoelectric point; PLLD, Polylysine dendrimers; PLN, Phospholamban; POEGMA-PHPMA, Poly(oligo(ethylene glycol) methyl ether methacrylate)-Poly(2-hydroxypropyl methacrylate); PSA, Prostate-specific antigen; PSC, Peptide sesame cake; PTMs, Post-translational modifications; RAFT, Reversible addition-fragmentation chain transfer; RBD, Receptor-binding domain; RBM, Receptor-binding motif; ROS, Reactive oxygen species; SARS-CoV-2, Severe acute respiratory syndrome coronavirus 2; SELEX, Systematic evolution of ligands by the exponential enrichment; SF, Silk fibroin; SHR, Spontaneously hypertensive rat; SIRT6, Sirtuin 6; TAT, Cell penetrating peptide; TNFα, Tumor necrosis factor α; TP, Tyrosine phosphatase; TPE, Tetraphenylethene; TUNEL, Terminal deoxynucleotidyl transferase dUTP nick end labelling; VEGF, Vascular endothelial growth factor; VIP, Vasoactive intestinal peptide; 3D, Three-dimensional.

* Corresponding authors at: Beijing Technology and Business University, No. 11 Fucheng Street, Haidian District, Beijing 100084, China.
E-mail addresses: zhangcn@btbu.edu.cn (C. Zhang), lixt@btbu.edu.cn (X. Li).

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Evaluation of Industrial Development in Cottage and Village Industries of Thane District

Dr. Nitin Vinayak Gaikwad,

Assistant Professor, Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli (India)

ABSTRACT

Thane is the third most industrialized quarter in the state of Maharashtra. There are 1548 large and medium scale and 18480 small scale diligence in the quarter. The main products of this diligence are medicines, Fabrics, Plastics, Rubber, steel medicinals, engineering, diseases, electronics, and chemicals. The Thane-Belapur-Kalyan artificial belt is the center of largely sophisticated ultramodern diligence. In Ambernath, Bhiwandi, Belapur, Tarapur, and Murbad these are nearly 4000 diligence which contributes towards the industrialization of the quarter manufacture of Rice manufactories at Digheshi (Bhiwandi) and vada, Khandsari at Palghar, Village diligence at Bhiwandi and Chinchani, Bricks and crockery making at Palghar. Besides the above-mentioned diligence fishery and forestry were also carried out on a Co-operatives base. All these artificial Co-operatives societies were formed by Workers, crafters, and occasionally by professed workers and comported of embroiderer's tanners, carpenters, blacksmiths, essence workers, potters, rice pounders, and others. It'll be seen from the above that progress made by the Co-operatives societies in the field of manufacturing and processing was veritably limited in Thane quarter and artificial Cooperation had touched only much small diligence similar as forestry, fishery, vill diligence, rice shop, engineering, and leather goods, etc. This Paper concentrated on geographical analysis of the evaluation and development of assiduity in the Thane quarter.

KEYWORDS: Talukawise distribution of cottage and village industries in Thane district, Government policies, and industrial development in Thane district.

Introduction:

The growth and industries depend upon several factors viz. Availability of various resources, climate, transport network, workers, market facilities, capital, and power, Besides these factors efforts made by either individual entrepreneurs or co-operative societies or industrial estate or government, prove significant for the growth of industries in any region. Efforts of these four agencies i.e., individual entrepreneurs, cooperative societies, Industrial estates, and Government create pre-condition and infra-structure which are essential for industrialization.

These efforts though basically essential are not to be necessarily conducive to proper regional development. These efforts if done on a good scientific-based then proper utilization of resources is a possibility while planning a region industrially. It is necessary to see whether the contemporary efforts put in by these agencies are competent to use the region's resources efficiently and optimally. Therefore, our aim here is to examine the extent of the efforts put in by the individual entrepreneurs. Co-operative societies, Industrial estates, and government in the Thane district for the development of industries.

Database and Methodology:

The primary and secondary data will be used for the study. Particularly the period of study will be chosen from 2001 to 2012 for the collection of primary data, special questionnaires will be used. The broad picture of the present pattern of land utilization of industrial cropping pattern of production of industrial crops will be prepared with the help of secondary data obtained from Socio-Economic review, District statistical abstract and District census handbook, etc.

Data regarding the number of Cottage and Village industries, capital investment and working capital capacity of utilization, Value of finished products or its market value and its profit will be considered some data will be obtained from District industrial center (DIC) and field survey, a special questionnaire has been used to collect data. Data collected through primary and secondary sources will be proceeded and represented by statistical data and cartographic techniques.

Talukawise Distribution of Cottage and Village Industries in Thane District:

In Thane district total cottage and village, the industry was 246 out of them the highest share of cottage and village industry was found in Bhiwandi Tahsil 49 means 19.92% followed by Vada 48 (19.51%) Whereas the lowest share was found in Talasari and Vikramgad Tahsil there is only one each cottage and village industry was found, and the percentage of industries was (0.41%). Palghar and Shahapur Tahsil also have a maximum number of cottage and village industries the share of Palghar Tahsil was 13.82% and Shahapur Tahsil share was 13.01% during the period under investigation.

Bharati Vidyapeeth’s Dr. Patangrao Kadam Mahavidyalaya, Sangli

NISP and state startup policy

NISP and state startup policy

NISP and state startup policy

1. **VISION:**

   To support and provide a start-up platform to new innovators and entrepreneurial talents of DPKM.

2. **MISSION:**

   1. Establishing a start-up and incubation centre at DPKM.
   2. Creating a sustainable ecosystem of innovation in the college.
   3. Enhancing the links between DPKM, research laboratories, universities, and industrial community.

3. **OBJECTIVES:**

   1. Encouraging students and faculties to bring innovative ideas.
   2. Motivating students for self-employment which in turn leads to entrepreneurships.
   3. To attract small-scale investment into the incubation and start-up ecosystem from the industries.
   4. To develop a start-up supporting network between DPKM and different industries.
   5. Establishing research-based laboratories for implementation of start-up ideas of students and faculties.

4. **THRUST AREAS:**

   1. To implement start-up strategies for promoting innovation and entrepreneurship at DPKM.
   2. To establish well-equipped labs and infrastructures for start-up programme.
   3. To create well-established path for entrepreneurs.
   4. Encouraging collaboration between DPKM, R&D laboratories, and industries for knowledge exchange.
   5. Regular assessment of start-up project performance.

5. **GOALS:**

   1. To implement student ideas into small scale start-up.

2 Attracting the funds from local industries for the implantation of start-up ideas.
3 To develop research collaborations between college and different research laboratories.
4 To collect ideas from students and faculties. Evaluating and implementing these ideas to enhance self-employability which will results into entrepreneur.
5 Organizing Intellectual Property Rights (IPR) workshop to enhance knowledge of students, research scholars, and faculties.
6 To arrange an orientation session on Patent Writing Skills

6. POLICY DOCUMENT:

DPKM Innovation and Start-up Policy document is divided into the following broad points:

6.1. To Implement Start-up Strategies for Promoting Innovation and Entrepreneurship at DPKM: The entrepreneurial and innovation activities are the part of DPKM's financial strategy. So, we will create DPKM-IIC fund for national innovation and start-up activities. Hence, around 1% fund of the total annual budget of the institution will be allocated for the funding and supporting innovation and start-ups related activities. All achievements and performance of entrepreneurial and innovation activities will be monitored by IIC.

6.2. To Establish Well-Equipped Labs and Infrastructures for Start-up Programme: DPKM has a well-established and well-equipped labs as well as infrastructures. These facilities will certainly enhance the technical skills of the users. Faculty and Students are allowed to take advantage of these available facilities of the College. DPKM will provide a platform to students, faculty and staff for creation of innovation and pre-incubation activities.

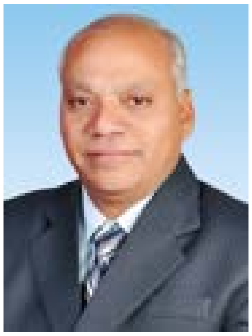
6.3. To Create Well-Established Path for Entrepreneurs: A well-established path will be created for the young entrepreneurs and innovators. DPKM will promote to utilize infrastructure created, available resources, and annual institutional budget for an effective progress of the proposed innovative ideas. The newly developed pre-incubation facilities are available for students, staff and faculty of all disciplines across the DPKM. DPKM will take initiative to support pre-incubation using internal and external sources. The innovative ideas from master degree and PhD students will be expected to send to different funding agencies such as DST-SERB, CSIR, UGC, and AICTE in the form of projects.

6.4. Encouraging Collaboration between DPKM, R&D Laboratories, and Industries for Knowledge Exchange: DPKM has several potential partners including scientists, patent officers, research-oriented laboratories, and small-scale industries. These collaborations will substantially enhance the progress of entrepreneur and innovation programme of DPKM. The knowledge exchange is one of the most important aims of innovations and start-ups and will be achieved by the active participation of students and faculties.

6.5. Regular Assessment of Start-up Project Performance: The regular assessment of funding, infrastructure support, start-ups created, and established relationships with industries will be done with a specific period of time by IIC committee. The progress of pre-incubation, incubation, entrepreneurship implemented at DPKM will be evaluated in each meeting of IIC.

7. Institution's Innovation Council (IIC) Committee:

Sr. No.	Name of Member	Department	Key Role / Assigned Position
1	Prin. Dr. D. G. Kanase	Chemistry	President
2	Dr. A. R. Supale	Chemistry	Vice-President
3	Dr. S. T. Mane	Chemistry	Convener & Start-up Co-ordinator
4	Dr. B. B. Ballal	Microbiology	IPR Cell Coordinator
5	Dr. M. J. Dhanavade	Microbiology	ARIIA Coordinator
6	Dr. T. R. Lohar	Chemistry	Internship Co-ordinator
7	Dr. D. P. Nade	Physics	Innovation activity Co-ordinator
8	Ms. J. D. Hatkar	Library	Social Media Co-ordinator
9	Dr. A. H. Jadhav	Commerce	Member
10	Mr. M. P. Gavit	Botany	Member
11	Mr. N. P. Bahiram	Zoology	Member
12	Ms. R. Waghmare	English	Member
13	Dr. V. M. Dhavale	CSIR-CECRI, Chennai	Patent Expert
14	Dr. S. B. Kamble	CSIR-CSMCRI, Bhavnagar	Patent Expert



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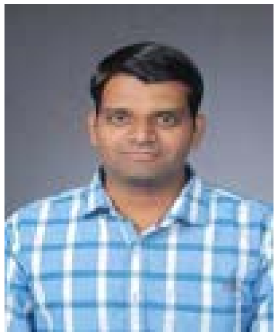
President



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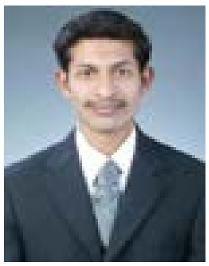

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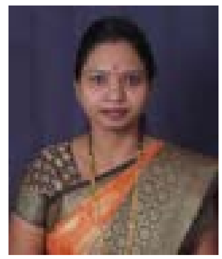
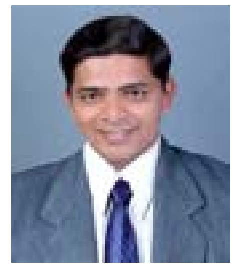
Dr. D. P. Nade
Innovation activity Co-ordinator



Ms. J. D. Hatkar
Social Media Co-ordinator



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Ms. R. Waghmare
Member

Dr. V. M. Dhavale
Patent Expert

Dr. S. B. Kamble
Patent Expert

PRINCIPAL,
Dr.Patangarao Kadam Mahavidyalaya,
SANGLI-416 416.(Sangliwadi.)

Dr. D. G. Kanase
Principal
Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya,
Sangli - 416416.