



Full Length Article

Preparation and characterization of Pt loaded WO₃ films suitable for gas sensing applicationsR. Jolly Bose^{a,b}, Navas Illyasukutty^{a,c}, K.S. Tan^d, R.S. Rawat^d, Murukesan Vadakke Matham^e, Heinz Kohler^c, V.P. Mahadevan Pillai^{a,*}^a Department of Optoelectronics, University of Kerala, Kariavattom, Thiruvananthapuram 695581, Kerala, India^b Department of Physics, Government College Kariavattom, Thiruvananthapuram 695581, Kerala, India^c Institute for Sensor and Information Systems (ISIS), Karlsruhe University of Applied Sciences, Moltkestr.30, D-76133 Karlsruhe, Germany^d Natural Science and Science Education, National Institute of Education, Nanyang Technological University, Singapore 637616, Singapore^e Division of Manufacturing Engineering, School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore 637616, Singapore

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ABSTRACT

This paper presents the preparation of nanostructured platinum (Pt) loaded tungsten oxide (WO₃) thin films by radio frequency (RF) magnetron sputtering technique. Even though, Pt loading does not produce any phase change in WO₃ lattice, it deteriorates the crystalline quality and induces defects on WO₃ films. The Pt loading in WO₃ has profound impact on structural and optical properties of the films by which the particle size, lattice strain and optical band gap energy are reduced. Nanoporous film with reduced particle size is obtained for 5 wt% Pt loaded WO₃ sample which is crucial for gas sensors. Hence the sensing response of 5 wt% Pt loaded sample is tested towards carbon monoxide (CO) gas along with pure WO₃ sample. The sensing response of Pt loaded sample is nearly 15 times higher than pure WO₃ sample in non-humid ambience at an operating temperature 200 °C. This indicates the suitability of the prepared films for gas sensors. The sensing response of pure WO₃ film depends on the humidity while the Pt loaded WO₃ film shows stable response in both humid and non-humid ambiances.

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1. Introduction

Tungsten oxide (WO₃) is an n-type semiconducting material which is widely studied as a gas sensing material for sensing gases such as H₂, CO, NO_x, H₂S, CO₂, NH₄ and SO₂ [1–6]. Pt is known to be the most effective catalyst that can greatly promote sensing of reducing gas including hydrogen and carbon monoxide. Hence, it can be used effectively to increase sensitivity and selectivity of gas sensors [2,7–14]. There are reports of WO₃ gas sensors with active layer of Pt film on the surface [15–17]. In multi-layer films, the active surface area of the metal oxide film will be partially covered by the surface layer of metallic film and also, there is low chance of accessibility of ambient gas to the base material. This can be avoided by loading platinum powder in WO₃, instead of coating platinum layer over tungsten oxide. The performance of a thin film gas sensor mainly depends on the adsorption-desorption process happen on the surface which in turn depends on the porosity and nanostructure of the film. In metal oxide gas sensors, the oxygen vacancies and other defects in crystal structure

can increase its sensitivity [1]. Therefore, it is essential to develop porous and nanostructured sensing layers for better sensitivity. We have prepared nanostructured tungsten oxide thin films with various platinum (Pt) loading concentrations using RF magnetron sputtering technique and their structural and optical properties are studied. The initial study of suitability of the prepared films for gas sensing applications is done. Carbon monoxide (CO) is one of the major harmful gases present in the universe which is colourless, odorless and tasteless [18,19] and hence the gas sensing response of pure and 5 wt% Pt loaded WO₃ film are tested towards carbon monoxide (CO) gas at operating temperatures 200, 300 and 400 °C, in relative humidity 0 and 50%.

2. Experimental details

2.1. Preparing thin films for structural and morphological studies

Platinum (Pt) nano-powder (Aldrich, purity 99.99%, size <100 nm) is mixed in different proportions (0, 0.5, 1, 2 and 5 wt %) with tungsten oxide (WO₃) powder (Aldrich, purity 99.99%) and thin films are prepared by RF magnetron sputtering technique. The preparation conditions are same as that reported earlier

* Corresponding author.

E-mail address: vpmpillai9@gmail.com (V.P. Mahadevan Pillai).

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குறுந்தொகையில் பாலை பாடிய பெருங்கடுங்கோ கவிதைகளில் முதல் மற்றும் கருப்பொருள் வருணனை

மீ.செய்தலி பாத்திமா

முனைவர் பட்ட ஆய்வாளர், தமிழ்த்துறை

பல்கலைக்கழக கல்லூரி, கேரளப் பல்கலைக் கழகம்,பாளையம், திருவனந்தபுரம்

ஆய்வுச் சுருக்கம்

தமிழின் தொன்மையான இலக்கியங்களில் வருணனை என்பது புனைவுரை, அணி, விரித்துரைத்தல், குறித்துரை, பண்புரு என்பன போன்ற பல்வேறு பெயர்களில் இடம்பெற்றுள்ளன. சொல்லுகிற செய்திக்கு சுவாரஸ்யமான சூழமைவு கொண்டு வருணித்தல் என்பது சிறப்பு வாய்ந்த கவிதைக் கூறுகளில் ஒன்றாகும். சங்க அகப்பாடல்களில் இவ்வண்ணனைகள் மிகவும் நுட்பமான முறையில் அமைந்துள்ளது. இது சங்கப் புலவர்களின் தனித்தன்மையைப் புலப்படுத்துவதாக உள்ளது. சங்க அகப்பாடல்களில் வருணிப்பு நிகழ்கின்ற தளங்களில் முதற்பொருளும், கருப்பொருளும் முக்கிய இடத்தைப் பெறுகின்றன. அந்த வகையில் பாலை பாடிய பெருங்கடுங்கோ பாடல்களில் காணப்படும் முதல் மற்றும் கருப்பொருள்கள் சார்ந்த வருணனை அவருடைய புலமைச் சிறப்பை இன்னும் மெருக்கேற்றுவதாக அமைந்துள்ளது என்பதனை எடுத்துக்காட்டுவதே இக்கட்டுரையின் நோக்கமாக அமைகிறது.

முன்னுரை

வருணனை அல்லது வருணிப்பு என்பது கலைவடிவத்தின் ஒரு பண்பு, ஒரு பொருளை அது இன்னது எனக் குறிப்பிடுதல் என்ற நிலையில் அல்லாமல், அத்தகைய ஒன்றை விசாலமாகவும், விரிவாகவும் விளக்குகிற நிலையில் சொல்லுவது வருணனை ஆகும். பாடலின் தேவையை ஒட்டிவரும் இத்தகைய வருணனை அல்லது சித்தரிப்பு சங்க இலக்கியத்தில் பிரதானமாகக் காணப்படுகிறது. சொல்லுகிற செய்திக்கு சுவாரஸ்யமான சூழமைவு கொண்டு வருணித்தல் சங்கப் புலவர்களின் தனித்தன்மையாகும். ஒரே வகையான பொருள் - ஒரே வகையான வருணிப்பு என்பதனைப் பல புலவர்கள் தவிர்த்துள்ளனர். அந்த வகையில் குறுந்தொகையில் பாலைபாடிய பெருங்கடுங்கோ கவிதைகளில் காணப்படும் முதல் மற்றும்

கருப்பொருட்களில் வருணனை அமைந்துள்ள பாங்கை விளக்குவதே இக்கட்டுரையின் நோக்கமாகும்.

வருணனை - சொற்பொருள் விளக்கம்

வருணனை என்பது 'வர்ணனா' என்ற வடசொல்லின் தமிழ் வடிவம் ஆகும். வர்ணம் என்னும் வடசொல் வண்ணம், ஓவியம், சித்திரம் என்னும் பொருள் தருவதாகும். பொருளை அதன் பல்வேறுபட்ட பண்பும், தொழிலும் பயனும் எளிதில் புலனாகும்படி வண்ணந் தீட்டப்பட்ட ஓவியக்காட்சி போல் அழகும் சுவையும் தோன்றச் சொல்வது வருணனை என விளக்கலாம். வருணனை என்ற சொல்லை தொல்காப்பியம் நேரிடையாக பயன்படுத்தவில்லை எனினும் அவற்றிற்குரிய மூலாதாரங்களையும், களன்களையும், பேசியிருக்கிறது.

வருணனையின் தேவை

படைப்பாளியின் கற்பனைத்திறன், புனைவு செய்கிற ஆற்றல், மொழியின் ஆளுகைத்திறன், அழகியல் பார்வை அதன் வெளிப்பாடு முதலியவற்றை இது இனங்காட்டுவதாக ஆகிறது. இது வாசகரைப் பாடலின் மையத்தை நோக்கி அழைத்துச் செல்கிறது. இதன் மூலமாகவே காதல், வீரம், கொடை, புகழ், வறுமை, வளமை, முதலியனவும் முக்கியமாக இயற்கை ஆண்-பெண் தோற்றப்பொலிவுகள், எடுத்துச் சொல்லப்படுகின்றன. மற்றும் திணைசார் வாழ்க்கையும் சொல்லப்படுகிறது.

பெருங்கடுங்கோவின் புலமைச் சிறப்பு

சங்கப் புலவர்களுள் 'பாலை' என்ற அடைமொழியைத் தம் பெயருடன் கொண்டுள்ள ஒரே புலவர் பாலை பாடிய பெருங்கடுங்கோ ஆவார். இவர் சேர நாட்டைச் சார்ந்த புலவர் ஆவார். அகப்பொருள் திணைகளுள் 'பிரிதலும் பிரிதல் நிமித்தமும்' *என்னும் உரிப்பொருளை உடைய பாலைத்திணையைப் பாடுவதில் மிக்க ஆற்றல் வாய்ந்தவர். ஆதலால் பெருங்கடுங்கோ என்ற தமது இயற்பெயருக்கு அடைமொழியாகப் 'பாலை பாடிய' என்னும் சிறப்புத் தொடரைச் சேர்க்கப் பெற்றார். இச்சிறப்பு வாய்ந்த புலவர் குறுந்தொகையில் பாலைத்திணைச் சார்ந்து 9 பாடல்கள் பாடியுள்ளார். சங்க அகப்பாடல்களில் வருணிப்பு நிகழ்கின்ற தளங்களில் முதற்பொருளும், கருப்பொருளும் முக்கிய இடத்தைப் பெறுகின்றன. முதற்பொருள் என்பது நிலமும், அதனோடு இயைந்த பொழுதும் ஆகும். இவற்றின் வெளிப்பாடாக அமைபவை கருப்பொருட்கள். அவ்வந்நிலங்களுக்குரிய பிரத்தியேகமான தெய்வங்கள், விலங்குகள்,

Protein-Assisted Supramolecular Control over Fluorescence Resonance Energy Transfer in Aqueous Medium

Vijayakumar C. Nair,^{*,†,‡,§} Kalathil K. Kartha,[§] Bijitha Balan,[†] Susanna Poullose,^{†,‡} and Masayuki Takeuchi^{*,§}

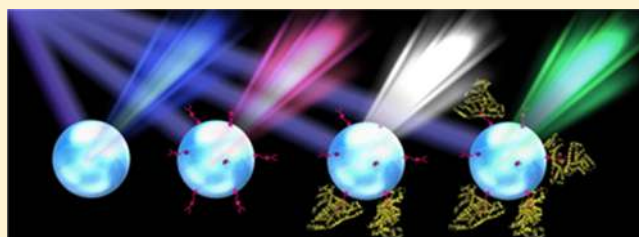
[†]Photsosciences and Photonics Section, CSIR–National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram 695 019, India

[‡]Academy of Scientific and Innovative Research (AcSIR), Ghaziabad 201002, India

[§]Molecular Design & Function Group, Research Center for Functional Materials, National Institute for Materials Science (NIMS), 1-2-1 Sengen, Tsukuba 305-0047, Japan

Supporting Information

ABSTRACT: The supramolecular approach has been exploited to modulate the fluorescence resonance energy transfer between an oligofluorene fluorophore and an ionic styryl dye with the assistance of a protein (bovine serum albumin) in aqueous medium. Self-assembled nanoparticles of oligofluorene with a negatively charged surface have functioned as the energy donor, and the positively charged styryl dye acts as the energy acceptor. The hydrophobic pockets in the secondary structure of the added protein enabled complimentary supramolecular interactions in the microenvironment to the dyes, thereby reducing the charge-transfer phenomenon in the dye and favored emission from the locally excited states. As a result, modulation of the energy transfer was observed, yielding significant tuning in emission wavelengths (or color) of the donor–acceptor complex.



Energy transfer is a key step in many natural processes, say, for instance, photosynthesis, where arrays of chlorophyll allow the transfer of energy to the reaction center. By mimicking nature, many artificial systems have been developed. However, the efficient transfer of energy from the donor to acceptor is still challenging, particularly in an aqueous medium. When comparing many other approaches, supramolecular interactions provide a versatile route for organizing donor and acceptor molecules for efficient fluorescence resonance energy transfer (FRET).^{1–15} Easy control over the FRET efficiency, and hence emission intensity and wavelength (or color) tuning, is easily possible in such systems through simply varying the donor–acceptor ratio and/or modulating their interactions.^{16–28} However, such approaches rarely work in an aqueous medium because of the competing hydrogen-bonding interactions by water molecules. Rationally designed molecular systems are necessary to address such issues.^{29,30}

Earlier, we have reported self-assembled, negatively charged nanoparticles of oligofluorene derivatives in aqueous medium.^{31–33} These nanoparticle assemblies were found to be excellent energy donors to suitable acceptor dyes, either encapsulated within or adsorbed on to the surface. As these assemblies are stable in an aqueous environment, they are ideal candidates for interacting with biological molecules for the development of novel hybrid materials. In this context, herein, we report a supramolecular tricomponent system consisting of an oligofluorene nanoparticle, a fluorescent cationic dye, and a

ternary complex. Moreover, it provided a rigid, nonpolar microenvironment to the dyes, thereby reducing the charge-transfer phenomenon in the dye and favored emission from the locally excited states. As a result, modulation of the energy transfer was observed, yielding significant tuning in emission

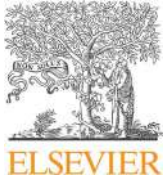
protein bound together through noncovalent interactions. Our studies revealed that the supramolecular interactions of the protein bovine serum albumin (BSA) could induce an excellent control over the FRET efficiency from the nanoparticles to the cationic dyes. Consequently, significant emission intensity enhancement and color tuning were achieved on single wavelength excitation.

An ionic styryl dye, 4-(4-(diethylamino)styryl)-1-methylpyridinium iodide (DASPMI), which belongs to the important class of styryl dyes,^{34–39} was used as the acceptor. The nanoparticles were derived from an oligofluorene derivative (OF) which consists of three fluorene units connected through the 7,7'-positions having two dodecyl chains at the 9-position. Hydrogen-bonding carboxylic acid groups were incorporated with the oligomer at the terminal positions. The chemical structures of both OF and DASPMI are shown in Scheme 1. Our previous studies revealed that the hydrogen-bonding groups play an important role in the stability and functional properties of fluorene-based nanoparticles in an aqueous environment.³² It was assumed that the polar hydrogen-bonding groups of the molecules present at the periphery of the nanoparticles interact with the polar aqueous medium,

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Data Article

Metabarcoding data of bacterial diversity of the deep sea shark, *Centroscyllium fabricii*

Tina Kollannoor Johny, Bindiya Ellathuparambil Saidumohamed, Raghul Subin Sasidharan, Sarita Ganapathy Bhat*

Department of Biotechnology, Cochin University of Science and Technology, Kalamassery, Cochin 682022, Kerala, India

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ABSTRACT

This data article describes the bacterial diversity of the deep sea shark, *Centroscyllium fabricii*. The data was acquired by metabarcoding using 16S rDNA. *Centroscyllium fabricii*, a deep sea shark found at depths below 275 m was sampled during Sagar Sampada cruise no 305 in the Indian Ocean and metagenomic DNA was isolated from the gut contents using QIAamp DNA stool minikit. V3 region of 16S rDNA region was amplified and the amplicons were sequenced on Illumina MiSeq system using 151 bp × 2 paired end reads. The data of this metagenome is available in the BioSample Submission Portal as Bio-Project PRJNA431407 and Sequence Read Archive (SRA) accession number SRR6507004.

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Specifications table

Subject area	Biology
More specific subject area	Metagenomics
Type of data	FastQ file
How data was acquired	Illumina MiSeq
Data format	Raw
Experimental factors	Environmental sample

* Corresponding author.

E-mail address: saritagbhat@gmail.com (S.G. Bhat).<https://doi.org/10.1016/j.dib.2018.10.062>2352-3409/© 2018 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).



BaCf3: highly thermostable bacteriocin from *Bacillus amyloliquefaciens* BTSS3 antagonistic on food-borne pathogens

E. S. Bindiya¹ · K. J. Tina¹ · Raghul Subin Sasidharan¹ · Sarita G. Bhat¹

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Abstract

In the present study, we characterized bacteriocin BaCf3, isolated and purified from *Bacillus amyloliquefaciens* BTSS3, and demonstrated its inhibitory potential on growth and biofilm formation of certain food spoilage bacteria and pathogens. Purification was by gel filtration chromatography and its molecular weight was 3028.422 Da after MALDI-TOF MS. The bacteriocin was highly thermostable withstanding even autoclaving conditions and pH tolerant (2.0–13.0). The bacteriocin was sensitive to oxidizing agent (DMSO) and reducing agent (DTT). The de novo sequence of the bacteriocin BaCf3 was identified and was found to be novel. The sequence analysis shows the presence of a disulphide linkage between C6 and C13. The microtitre plate assay proved that BaCf3 could reduce up to 80% biofilm produced by strong biofilm producers from food samples. In addition, BaCf3 did not show cytotoxicity on 3-TL3 cell line.

Keywords Bacteriocin · *Bacillus* · MALDI-TOF · Biofilm · Cytotoxicity

Introduction

Food-borne diseases and contaminated food are chief concern to humankind. Though the type and severity of food-borne diseases have changed through years, it is still an issue in all nations. According to WHO, almost 1 in 10 people in the world fall ill and 420,000 die every year (WHO 2015) due to food contamination. Bacterial biofilms are one of the major causes of food contamination. Biofilm formation imparts antibiotic resistance to the pathogens leading to complications. This difficulty in successful treatment

of biofilm-associated infections calls for the hunt of novel compounds and technologies for biofilm eradication. Many natural products like antimicrobial peptides and bacteriocins have been successfully used as antibiofilm agents in food preservation and medicine (Spizek et al. 2010).

Biofilms are irreversible assemblage of surface-associated microbial cells enclosed in an extracellular polymeric matrix substance. According to Costerton et al. (1987) a biofilm is a functional consortium of microorganisms attached to a surface and is embedded in extracellular polymeric substances (EPS). They are difficult to eradicate completely, as they are often resistant to normal sanitation procedures that can result in detrimental processes. Even when a food surface appears to be clean, there is the possible presence of biofilm, a potential hazard that needs elimination. An antibiofilm drug can either facilitate the dispersion of preformed biofilms or inhibit the formation of new biofilms in vivo. The biopreservative effect of sonorensin-coated film in chicken meat and tomato samples by inhibiting spoilage bacteria, demonstrated the potential of sonorensin as an alternative to current antibiotics/ preservatives (Chopra et al. 2015). Antimicrobial protein from a *Citrobacter freundii* strain ATCC 43864 named ColA-43864 exhibited inhibitory activity against species from several genera of Gram-negative bacteria including *K. pneumonia* and *Escherichia coli* and was effective against biofilms (Shanks et al. 2012). Costa et al.

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✉ Sarita G. Bhat
saritagbhat@gmail.com; sgbhat@cusat.ac.in

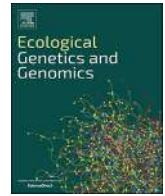
E. S. Bindiya
bindiya79@yahoo.co.in

K. J. Tina
tina.kj05@gmail.com

Raghul Subin Sasidharan
raghulzubin@gmail.com

¹ Department of Biotechnology, Cochin University of Science and Technology, Cochin 682 022, India

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Inferences of gut bacterial diversity from next-generation sequencing of 16S rDNA in deep sea blind ray - *Benthobatis moresbyi*

Tina Kollannoor Johny, Bindiya Ellathuparambil Saidumohamed, Raghul Subin Sasidharan, Sarita Ganapathy Bhat*

Department of Biotechnology, Cochin University of Science and Technology, Kalamassery, Cochin, 682022, Kerala, India

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ABSTRACT

The complex polymicrobial physiology of the fish gut, ‘worlds within worlds’ are governed by various factors. Taxonomic profiling of fish gut microflora through metagenomics approach has not received much attention to date. The present study explored the gut microbiota composition of *Benthobatis moresbyi*, sampled from the Arabian Sea and compared it to the existing metagenomic datasets. V3 region of 16S rRNA gene was amplified from metagenomic DNA and sequenced on Illumina MiSeq system. Taxonomic classification was done at various levels. *Actinobacteria*, *Proteobacteria* and *Acidobacteria* were the predominant phyla, in stark contrast to human and other gut microbiomes. *Alphaproteobacteria* and *Actinomycetales* were the predominant classes. *Acidobacteriales* and *Solibacterales* were dominant in the phylum *Acidobacteria*. Comparison of the taxonomic distribution of *Benthobatis moresbyi* gut microflora to other metagenomic datasets in MG-RAST metagenomics analysis server revealed more similarity to the microbiota of various ocean depths rather than guts of other terrestrial animals.

1. Introduction

Fish gut is a highly complex ecosystem representing an interface between the external environment and the body. The diverse, polymicrobial ecology of fishes are governed by factors such as fish type, developmental stage, diet, conditions of the surrounding environment, climate and other stress factors [1–6]. Gut microbiota of fish are involved in nutrient metabolism, homeostasis, xenobiotic metabolism, development of immune system, renewal of epithelial cells and several physiological processes of the host system [7–9]. They encompass both beneficial bacteria and pathogens, which is in accordance with the overall health status of fishes.

The NIH-sponsored human microbiome project and the valuable insights offered therein has accelerated interest in the taxonomic profiling of the highly selective gut environment of various vertebrates. However fish gut microbiome has not received much attention. Most of the earlier studies on fish gut microbes were based on culture dependent approaches. But, only 0.001–0.1% of microbes in seawater are cultivable [10]. Thus, metagenomic or the culture independent approach remains the most viable option to catalogue the microbial diversity of such ‘worlds within worlds’. The emergence of various next generation sequencing (NGS) platforms has further revolutionized the

analysis of the composition and biodiversity of such metagenomic datasets.

Benthobatis moresbyi, locally named as dark blindray is a bathydemersal fish, found at depths ranging from 787 to 1071 m and little is known about its biology yet [11]. This study uses universal phylogenetic marker, 16S rDNA to characterise the microbial gut composition of this fish. Out of the nine hypervariable regions found in 16S rDNA, V3 and/or V6 regions have been used extensively for metagenomic studies [12,18], as they can provide sufficient information regarding the bacteria present in samples. Roche 454 and Illumina are the preferred NGS platforms used in metagenomic analyses of environmental samples. To date, few studies have used Illumina tags for the purpose [13–16]. Though Illumina reads are short, they can provide accurate taxonomic information comparable to the use of full length 16S rDNA sequence [17,18].

In this context, the present study uses Illumina MiSeq platform to sequence V3 region of 16S rDNA to analyse the diversity of gut microbiota of *B. moresbyi*. The study also seeks to compare the gut bacterial diversity of this deep sea ray fish to metagenomic datasets of gut microbiota of other organisms and that of marine environments.

* Corresponding author.

E-mail address: saritagbhat@gmail.com (S.G. Bhat).

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LANDSCAPE OF KANNUR: A GEOMORPHOLOGICAL APPRAISAL

T. K. Prasad

Assistant Professor, Department of Geography, Government College,
Kariavattom, Thiruvananthapuram, Kerala, India

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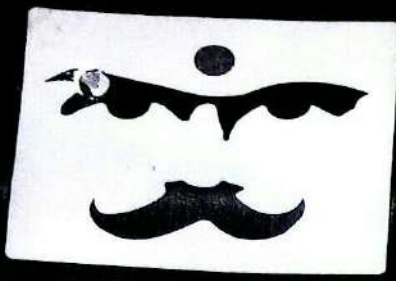
ABSTRACT

Geomorphology is the study of landforms and the analysis of processes that shape them. The most significant fact about the earth surface is that each area is unique and has its own assemblage of bio-physical setting. Since the combination of landforms and geomorphic processes varies from one region to the other, a proper understanding of them is essential for planning and development. Kannur is one of the fourteen districts of Kerala located in its northern part. It is characterized with diversified surface relief and distinctive geomorphic processes. The land undulates from steep slopes of Western Ghats in the east to the seashore in the west having a series of hills and valleys intersected by streams and rivers. Elevation ranges from 10 to 1800 meters. The geological formations in the district range from Precambrian to recent age. Kannur district is endowed with a well- developed drainage system. The district has a humid climate with an oppressive hot season from March to the end of May. Physical conditions are most ideal for insitu weathering and laterization. Isolated lateritic mesas rise abruptly all along the midlands of the district. Landscape possesses innumerable permutation combinations and their arrangement over the space is a basic domain of geographical research. The present study is intended to perceive the configuration of landforms in the study area from a geomorphological standpoint. This Paper is one of the outcomes of the Minor Research Project of the author, funded by ICSSR, New Delhi.

KEYWORDS: *Geomorphology, Landforms, Landscape Analysis, Laterites, Laterization*

INTRODUCTION

Landforms are natural irregularities on the earth surface. Geomorphology is the study of landforms and the analysis of processes that shape them. The most significant fact about the earth surface is that each area is unique and has its own assemblage of bio-physical setting. Socio-economic as well as cultural characteristics of man is an outcome of the physical setting of the region and his interaction with them. In fact, it is this myriad combination that shapes the status of a region in the economic fabric. Man is basically a terrestrial animal. The ever-increasing demand for food and space exerts more and more pressure on the land resource. The era calls upon an optimal growth of the human economy through sustainable utilization of natural resources. Since the combination of landforms and geomorphic processes varies from one region to the other, a proper understanding of them is essential for planning and development. Land possesses innumerable permutation combinations and their arrangement over the space is a matter of great importance for the advancement and sustenance of human society. This spatial variation or areal differentiation is the basic domain of geographical research. The present study is intended to examine the configuration of landforms in the study area from a geomorphologic standpoint.



ஆய்த எழுத்து

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குறுந்தொகையில் முல்லை நில வருணனை

*செய்தலி பாத்திமா.மீ. உதவிப்பேராசிரியர், தமிழ்த் துறை, காரியவட்டம் அரசுக் கல்லூரி, திருவனந்தபுரம், கேரளா - 695581.

முன்னுரை
திணை இலக்கிய அகக்கவிதைகள் இயற்கையைப் பின்னணியாகக் கொண்டு உருவாக்கப்பட்டுள்ளன. இப்பின்னணி அமைப்பு ஐந்திணைகளை வரையறை செய்தது. ஒவ்வொரு திணையும் ஒரு தனிப்பட்ட இடம் மற்றும் காலத்தைக் கொண்டு இனங்காணப்பட்டது. இதனை முதற்பொருள் என குறித்தனர். பாடல்களில் அவை சார்ந்த கருத்து விளக்கங்களை வருணனை மூலம் புலவர்கள் தந்தனர். இக்கட்டுரை குறுந்தொகை முல்லைத்திணைப் பாடல்களில் முதற்பொருளில் ஒன்றான நிலம் எவ்வாறு வருணனை செய்யப்பட்டிருக்கிறது என்பதனை ஆராயமுயல்கிறது.

நிலம்
ஐம்பூதங்களுள் முதலாவதாக வைத்து எண்ணப்படும் சிறப்பிற்குரியது நிலம். பழந்தமிழ் இலக்கண நூலான தொல்காப்பியம் குறிஞ்சி, முல்லை, மருதம், நெய்தல், பாலை என ஐவகைத் திணைகளைக் குறிப்பிட்டதோடு அவற்றை அன்பின் ஐந்திணை எனச் சிறப்பிக்கவும் செய்தது. அவற்றுள் பாலை தவிர ஏனையவற்றிற்கு அது நிலமும் குறிப்பிட்டுள்ளது. குறிஞ்சிக்கு மலையும், மலை சார்ந்த நிலமும் உரியதென்றும் முல்லைக்கு காடும் காடு சார்ந்த இடமும் உரியதென்றும், மருதத்திற்கு நீர்நிலைகளை உடைய வயலும் வயல்சார்ந்த நிலமும் உரியதென்றும் நெய்தலுக்கு மணலால் சூழப்பட்ட கடலும் கடல் சார்ந்த இடமும் உரியதென்றும் தொல்காப்பியம் சுட்டுகிறது. தொல்காப்பியத்திற்கு பிறகு தோன்றிய இலக்கண நூலான நம்பியகப்பொருள். வெப்ப மிகுதியால் வறட்சி ஏற்பட்ட சுரமும் சுரம் சார்ந்த நிலமும் பாலை எனக்குறிப்பிடுகிறது. *உ.உ.

முல்லைக்குரிய நிலம்

முல்லை காடும் காடு சார்ந்த பகுதியும் எனத் தொல்காப்பியம் சுட்டுகிறது. "மாயோன் மேய காடுறை உலகமும்" எனக் குறிப்பிடுவதிலிருந்து முல்லை நிலம் அடர்ந்த மரங்களையும் புதர்களையும் உடைய அகன்ற காட்டு நிலங்களை உடைய பகுதி என்பது புலனாகிறது. மேட்டு நிலப்பகுதிகளைக் கொண்டதாக முல்லை நிலம், தோற்றமளிக்கிறது. தரைப்பகுதி சரிவான நிலமாக அங்குமிங்கும் சிறுகுன்றுகளால் பிரிக்கப்பட்டதாகக் காட்சியளிக்கிறது. தாவரங்கள் அருகி வளர்கின்றன, பெரும்பாலும் குத்துப் புதர்ச்செடிகள். தரை பெரும்பாலும் கற்பாங்கானதாக உள்ளது. பருவ மழையின் குளிர்ச்சியும், முல்லைக் கொடியின் மணமும், ஆநிறை முதலான விலங்குகளின் செய்கைகளும் கொண்டு நிறைந்த நிலப்பகுதியாக காட்சியளிக்கிறது.

குறுந்தொகையில் முல்லை நில வருணனை

குறுந்தொகை முல்லைத் திணைப் பாடல்களில் நிலம் சார்ந்த பல்வேறு வருணனைகள் இடம்பெற்றுள்ளன. தொல்காப்பியர் முல்லைக்குக் குறிப்பிட்ட காடுறை உலகம் என்பதற்கு ஏற்ப நிலமானது காடு, காணம், காட்டுப்புதர் என்று சுட்டப்பட்டுள்ளது. 'முல்லை' என்னும் அடையோடு சேர்ந்தும் நிலம் வருணிக்கப்பட்டுள்ளமைக் குறிப்பிடத்தக்கதாகும். நிலம் பற்றிய வருணனைகளை இரண்டு விதமாகப்பகுத்துக் காணலாம். அவை,

1. காடு சார்ந்த வருணனை 2. முல்லை நிலம் சார்ந்த வருணனை என்பன.

1. காடு சார்ந்த வருணனை

காடு சார்ந்த வருணனைகளை அணுகி ஆராயும்போது, மூன்று விதமாகப் பகுக்கலாம். அவை, 1.1. கொன்றை மரங்கள் நிறைந்த காடு, 1.2. புன்செய் நிலம் அடங்கிய காணம், 1.3. மரம் சூழ்ந்த குறுங்காடு ஆகியன.

INDUCED RANKED SET SAMPLING WHEN UNITS ARE INDUCED FROM SEVERAL POPULATIONS

P. Yageen Thomas

Department of Statistics, University of Kerala, Trivandrum-695 581, India

Anne Philip ¹

Department of Statistics, University of Kerala, Trivandrum-695 581, India

1. INTRODUCTION

Random sampling is well known as an unrestricted method of collecting the units from a population. However, if collecting the units and measuring the characteristic of interest on them is expensive (or risky or painful), then one is compelled to look for alternative sampling methods which are capable of accommodating observational economy considerations. McIntyre (1952) first used a judgement method to rank the randomly chosen units within each of independent groups of units and devised a method of final selection of units from the groups of units based on their ranks and termed this method as ranked set sampling (RSS). Chen *et al.* (2004) have discussed extensively about the observational economy considerations accommodated in RSS as defined by McIntyre (1952). For more details, see Shaibu and Muttlak (2004), Al-Rawwash *et al.* (2010) and Samuh (2017). Ranking by judgement method is not suitable if there is a fear that ranking error which is otherwise known as imperfect ranking creeps in the ranking process of the units. In such situations Stokes (1977) introduced a scheme of sampling the units based on the measurements made on an easily measurable auxiliary variable X which is jointly distributed with the variable Y of primary interest, whose measurement is expensive and thereby defined the RSS in the following manner. Choose n^2 units randomly from the population and arrange them in the random order in n sets of n units each. Rank units within each set based on the measurement made on the auxiliary variable X of the units. Then from the i th set choose the unit ranked i and measure the variable Y of primary interest on this unit for $i = 1, 2, \dots, n$. Clearly, the observation obtained from the i th set is the concomitant of i th order statistic of X -observations in that set and we write it as $Y_{[i:n]i}$ for $i = 1, 2, \dots, n$. Then the observations $Y_{[1:n]1}, Y_{[2:n]2}, \dots, Y_{[n:n]n}$ are said to

¹ Corresponding Author. E-mail: anne04philip@gmail.com



Self-assembly and photoinduced electron transfer in a donor- β -cyclodextrin-acceptor supramolecular system[§]

RETHEESH KRISHNAN^{a,b}, SUMESH BABU KRISHNAN^{a,c}, BIJITHA BALAN^{a,d} and KARICAL RAMAN GOPIDAS^{a,c,*} 

^aPhotosciences and Photonics, Chemical Sciences and Technology Division, CSIR-National Institute for Interdisciplinary Science and Technology, Council of Scientific and Industrial Research, Thiruvananthapuram 695 019, Kerala, India

^bPresent address: Department of Chemistry, Government College for Women, Thiruvananthapuram 695 014, Kerala, India

^cAcademy of Scientific and Innovative Research (AcSIR), New Delhi 110 001, India

^dPresent address: Department of Chemistry, Government College Kariavattom, Thiruvananthapuram 695 581, Kerala, India

E-mail: gopidaskr@rediffmail.com; gopidaskr@gmail.com

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Abstract. Equimolar amounts of native β -cyclodextrin (β -CD), pyrene-linked adamantane (PYAD) and *tert*-butylpyromellitic diimide (PMDI) when dissolved in water self-assembled to form the supramolecular donor-acceptor system $\text{PYAD} \square \beta\text{-CD} > \text{PMDI}$. The high affinity of adamantane derivatives for inclusion binding in the β -CD cavity and the propensity of PMDI to undergo rim-binding at the narrow rim of β -CD led to the formation of $\text{PYAD} \square \beta\text{-CD} > \text{PMDI}$. The ternary complex $\text{PYAD} \square \beta\text{-CD} > \text{PMDI}$ was thoroughly characterized using various spectroscopic techniques. β -CD performs three functions in the self-assembled complex: (1) encapsulate the adamantane unit and keep the pyrene (PY) moiety above the secondary rim, (2) rim-bind PMDI and keep it at the primary rim, and (3) act as a spacer between pyrene and PMDI. Thus, the ternary complex can function as a donor-spacer-acceptor system capable of undergoing photoinduced electron transfer (PET). Upon excitation of the pyrene moiety in $\text{PYAD} \square \beta\text{-CD} > \text{PMDI}$ an electron is transferred from the excited pyrene to the PMDI ground state. Steady state and time resolved fluorescence experiments were carried out to study the PET in $\text{PYAD} \square \beta\text{-CD} > \text{PMDI}$. Existence of the ternary system and PET processes taking place within it are further supported by laser flash photolysis experiments.

Keywords. Cyclodextrins; donor-acceptor systems; inclusion binding; PET; supramolecular assembly.

1. Introduction

Significant progress was made in the past decades in the design and study of supramolecular donor-acceptor (D-A) systems capable of undergoing photoinduced electron transfer (PET) reactions as models for natural photosynthetic reaction centers and artificial light harvesting systems.¹⁻³ Hydrogen bonding, π -stacking and metal-ligand coordination are the most common interactions utilized in the design of non-covalent D-A systems.⁴⁻¹⁴ These interaction modes, however,

are not very useful in assembling D-A systems in aqueous solutions. Biological electron transfers occur in aqueous environments and in this context those interactions capable of achieving D-A assembly in aqueous solutions assume greater significance. Cyclodextrins (CDs), which are cyclic oligosaccharides with hydrophobic cavities, are ideal molecular receptors for building water-soluble supramolecular functional assemblies.¹⁵⁻¹⁹ Recently others²⁰⁻²⁹ and we^{30,31} have employed chromophore-appended CDs to assemble supramolecular D-A systems for PET reactions in

*For correspondence

[§]Dedicated to Professor M. V. George on the occasion of his 90th Birth Anniversary.

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Comparison of Preferred Foot and Non-preferred Foot Soccer Technique Level of Junior Players

Dr. Xaviour G.^{1*} Dr. Anjali O.²

¹Assistant Professor, Department of Physical Education, Government College Kariavattom, Kerala, India

²Assistant Professor, Department of Physical Education, Government Ayurveda College Tripunithura, Kerala, India

Abstract – Soccer is the most popular sport in the world. Techniques play an important role in the development of young soccer players. Performing the techniques in a perfect manner with both feet is essential for a good player. The purpose of the present study was to compare the preferred and non-preferred foot technical level of junior soccer players. Fifty male soccer players of the 13–18 age groups from Sree Ayyankali Memorial Govt. Model Residential Sports School in Vellayani, Thiruvananthapuram, and Kerala, India were randomly selected as subjects for the study. The variables selected for the study were Goal Kicking for Accuracy, Ground Passing for Accuracy and Air Passing for Accuracy. The tests selected for this study were the three H. A. Van Rossum and D. Wijbenga tests. The subjects were tested as per the procedure of the test in order to collect the data on the selected variables. Descriptive statistics such as mean and standard deviation (SD) were calculated in order to get a basic idea of the data distribution. A t-test revealed that the mean difference between preferred and non-preferred foot was significant ($P < 0.01$) for all the selected variables. It was concluded that the preferred foot scores of the subjects were significantly higher than the non-preferred foot scores on all the selected soccer techniques. It is recommended that a systematic training program may be chalked out for the improvement of both the preferred and non-preferred foot techniques for soccer players of different age and achievement level.

Keywords: Soccer, Techniques, Preferred Foot, Non-Preferred Foot

1. INTRODUCTION

Soccer is the most popular sports in the world with more than 240 million players worldwide. Men, women, children and adults with different levels of performance play the game regularly. Performance level of the players depends upon a variety of factors including their level of skill, their physical and physiological characteristics, their degree of motivation, and tactics applied by them against their opponents. A high level of all these factors leads them to better players.

Techniques, or sport-specific technical skills, are a central component in the development of young soccer players. Technique refers to the relationship and harmony a player demonstrates with the ball and describes the performance of a solitary action in isolation from the game, e.g. pass or dribbling (Bate, 1996). Soccer involves more number of techniques as the players can use most part of their body to control and play the ball. The techniques have to be

performed under pressure in different ways according to the situation and at times under the condition of fatigue. It needs greater balance, co-ordination, quickness, agility, speed, power etc to execute the techniques in a perfect way. High level of technique to perform the skill is essential to become a good player. The players have to attack and defend as per the situation demands. Therefore, it is important that all players achieve a high level of performance in the basic skills of kicking, passing, trapping, dribbling, tackling and heading.

For a successful soccer performance the mastery over performing the technique with both the limb is important. As the game involves speedy execution of the technique in the game situation, players need to have proficiency in executing the technique with both the limbs. A timely pass or a kick at the goal often decide the result of the game and therefore the techniques are to be practiced and mastered with

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Effective and Safe Methods of Stretching

Dr. Anjali O.^{1*} Dr. Xaviour G.²

¹Assistant Professor, Department of Physical Education, Govt. Ayurveda College Tripunithura

²Assistant Professor, Department of Physical Education, Govt. College Kariavattom, Trivandrum

Abstract – A sedentary lifestyle that involves long periods of sitting or driving can cause muscles to shorten and tighten which can lead to pressure on nerves and pain. By its effect of lengthening muscles, stretching promotes flexibility, that is, the ability to have a full range of motion about your joints. Regular stretching is just as important as regular exercise. Stretching exercises encourage lengthening of the muscles and their associated tendons, and oppose the shortening and tightening of muscles that can occur immediately after vigorous exercise, and as a product of ageing and inactivity. Not taking time to stretch can mean losing the ability to move freely and fully to compete in your perform the activities that are basic to your daily needs. Stretch only when your muscles are warm, as cold muscles are more likely to tear .Including a dedicated stretching routine (for 15 to 20 minutes and unrelated to an exercise session) in your exercise programme 2 or 3 times a week will be an additional help to maintaining your flexibility. De-stressing with stretches, in addition to getting the right amount of sleep, and eating nutritiously can also make a big impact on yourz overall wellness.

Key words: Stretching, Flexibility, De-Stressing

INTRODUCTION

Regular stretching is just as important as regular exercise. Stretching exercises encourage lengthening of the muscles and their associated tendons, and oppose the shortening and tightening of muscles that can occur immediately after vigorous exercise, and as a product of ageing and inactivity. A sedentary lifestyle that involves long periods of sitting or driving can cause muscles to shorten and tighten which can lead to pressure on nerves and pain. By its effect of lengthening muscles, stretching promotes flexibility, that is, the ability to have a full range of motion about your joints.

BENEFITS OF STRETCHING:

- Helps to improve flexibility (increases your range of motion)
- Assists in correct posture by lengthening tight muscles that pull areas of the body away from their intended position (because of so much time at our computers, many of us have tight chest muscles which pulls the shoulders and head forward, leaving us with a hunched shoulder look)
- Potential to decrease injury by preparing muscles for work before activity

- Increases blood and nutrient supply to muscles, thereby possibly reducing muscle soreness
- Even a short amount of time (10-15 minutes) of stretching can calm the mind, provide a mental break, and give your body a chance to recharge
- Regular stretching offers a chance to spend an hour releasing tension physically and mentally.

TYPES OF STRETCHING

Static stretching

Static stretching is considered the safest method of stretching. A static stretch should be held for 10 to 30 seconds at a point where the person can feel the stretch but do not experience any discomfort. If feels discomfort, ease back on the stretch. Remember not to bounce when holding the stretch.

Dynamic or ballistic stretching

These types of stretching require instruction from a qualified fitness instructor or sports coach, and may sometimes replace static stretches as part of a warm-up for strong activity. For example, if the chosen activity requires sudden bursts of power, such as jumping or sudden acceleration, then specific ballistic

Isozyme Analysis of Embryogenic and Non-Embryogenic Callus of Diploid Banana Cultivars

Smitha, P.D.*, Binoy, K.R. and Ashalatha S Nair

Department of Botany, University of Kerala, Kariavattom, Thiruvananthapuram 695581, India

*Corresponding author: smithadivakaran2009@gmail.com (ORCID ID: 0000-0003-3326-7038)

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ABSTRACT

Isozyme analyses were carried out on protein extracts of embryogenic and non-embryogenic callus derived from bract meristem of four diploid *Musa* cultivars using polyacrylamide gel electrophoresis. We examined the isozyme pattern of peroxidase, catalase, malate dehydrogenase and alcohol dehydrogenase for their utility as biochemical markers of banana embryogenic callus cultures. Peroxidase, catalase and alcohol dehydrogenase exhibited high intensity bands in the embryogenic samples, while the corresponding bands were either absent or faint bands were observed in the non-embryogenic callus. Malate dehydrogenase enzyme pattern exhibited homogenous bands in both the embryogenic and non-embryogenic samples.

Highlights

- Isozyme such as peroxidase, catalase and alcohol dehydrogenase exhibited high intensity bands in the embryogenic callus.
- For embryogenic calli identification, isozyme analysis can be used as biochemical markers.

Keywords: Peroxidase, Catalase, SOD, MDH, ADH

During the process of somatic embryogenesis and plant regeneration the screening of an embryogenic culture plays an important role, especially when cultures are derived from numerous cell lines. In many cases, embryogenic potential is identified by morphological characteristics. However such a visual screening is subjective and often applicable only after prolonged culture periods. An early biochemical identification of embryogenic potency would therefore, be of great help for an efficient plant regeneration. Biochemical characterization of cultured tissues and cells may be utilized in differentiating regenerable and non-regenerable cultures, which is a pre requisite for understanding the morphogenesis *in vitro*. Changes that occur in different enzyme system during cell or callus cultures have been studied in order to distinguish the organogenic from non-organogenic tissue. Few reports were published on biochemical differences between embryogenic and non-embryogenic callus

cultures with respect to polypeptide pattern (Chen and Luthe 1987). Many investigations have been made into the physiological changes taking place during organogenesis in callus cultures (Kavi Kishore and Mehta 1988). Several biochemical variables have been shown to discriminate embryogenic and non-embryogenic tissues. Distinct proteins (Sung and Okimoto 1983), isozyme forms and ethylene are among them. Everet *et al.* (1985) characterized maize callus types and demonstrated differences in the secreted polysaccharides and isozymes.

MATERIALS AND METHODS

Embryogenic and non-embryogenic calli derived from bract meristem of four diploid banana cultivars viz. *Musa acuminata* cv. Matti, cv. Sannachenkadali, cv. Chingan and cv. Njalipoovan were selected for isozyme profiling. Embryogenic callus was initiated from bract meristem inoculated on MS medium supplemented with TDZ (0.45 μ M) and

Effect of Laterite Mining on the Land Use of Midland Hillocks of Kannur District, Kerala - A Case Study

Dr. T. K. Prasad¹, Dr. G.R. Parthasarathy²

¹Asst. Professor, Department of Geography, Government College Kariavattom, Thiruvananthapuram

²Professor & Head (Rtd), Department of Geography, Madurai Kamaraj University, Madurai

Abstract: *The various dimensions of human intervention on natural processes and systems are of grave concern to geographers. Mining is one of the oldest professions of the world and it grew with the evolution of man and civilization. Environmental impacts of mining are important to the society in and around the mining complexes not only because of the direct impacts but also the indirect impacts. It being the fact, all the activities the human beings do are for the benefit of the society, the mining activities should also yield benefits to the society, which so far has not been taking place. Laterite is a typical rock formation found commonly in the tropical monsoon regions as a capping over the hillocks. It is best developed in the Western Ghats and its foothills. The thickness of lateritic cap varies from 10 to 70 meters. It is the characteristic feature of midland hillocks of north Malabar region of Kerala especially Kannur and Kasaragod Districts. In the areas of extensive laterite formations, its mining has emerged as a major economic activity of the local people. Present investigation is an attempt to analyse the effects of laterite mining on local land use from a geographical perspective.*

Keywords: Laterite; Mining; Midland hillocks; land use

1. Introduction

Land use is dynamic in nature. It is basically a function of physical and cultural variables. The land use pattern of a region is an outcome of natural and socio – economic factors which decide the utilization of land by man over time and space. The efficient use of land depends on the capacity of man to utilize the land and to manage it. Land is not only a resource, but also a resource base by itself. Land resources being finite in extend imply more judicious use to meet the ever-increasing demands. The unsustainable and unplanned exploitation of land resources is the major reason for degradation of our environment. This requires prudent use of land use/ land cover in the area. Mining industry has considerable aerial coverage, which is next only to agriculture among the primary activities. As mining yields quick (but short time) returns, agriculture always loses in competition where ever extractable resources occur. Here comes the significance of destiny of lateritic mesas of the study area. Mining and resultant socio-economic changes in the society make drastic changes in the land use pattern of the locality. In this context a case study on spatio-temporal analysis effects of laterite mining on the land use pattern of

mid land hillocks of Kannur district in Kerala is taken as the core theme of the present investigation.

2. Study Area

Irikkur block is typically the midland portion of Kannur district. The block extends from 11° 55' N to 12° 05' N latitudes and from 75° 20' E to 75° 45' E longitudes. It extends over a total area of 433 sq. km. The Block comprises of ten panchayaths namely Kolachery, Mayyil, Kuttiattur, Malappattam, Irikkur, Padiyoor, Sreekandapuram, Eruvessi, Payyavoor and Ulickal. (Fig.1). The eastern hilly tract gradually merges to the foothills of Western Ghats. Some parts of the block, mainly the areas adjoining to the Kattampally Lake, are flat and lie almost at sea level. The block has a general slope from northeast to southwest (Fig.1). Ulickal, Payyavoor and Eruvessi panchayaths are comparatively highland areas whereas Mayyil, Kuttiattur and Kolachery panchayaths are comparatively low lying areas. The study area is endowed with a well developed drainage network. Valapatanam River, one of the major west flowing rivers of the State flows through the central part of the block.

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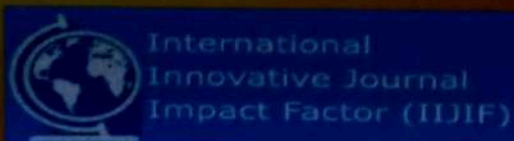
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डॉ० प्रकाश.ए*

*एसो० प्रोफेसर, गवर्मेन्ट कालेज, कार्यवट्टम, तिरुवनन्तपुरम, केरल

सारांश : भारत की जनता को निर्वाचित प्रतिनिधिक शासकों के समुख अपने मतभेदों को खुलकर अभिव्यक्त करने की आजादी संवैधानिक तौर पर मिली है। लेकिन संविधान के प्रावधानों के ही बल पर हमारे प्रतिनिधिक शासकों ने जनता को मिली इस आजादी को रद्द करने की कोशिश भी की है। 1975 में उद्घोषित आपातकाल की संवेदन-हीनता की स्थिति एवं राजनैतिक परिवेश को नरेश मेहता जी ने अपने काव्य के प्रतिपाद्य विषय के रूप में स्वीकृत किया है। 'अभिव्यक्ति की स्वतंत्रता' जब भी चर्चा की बात होती है तब भी 'प्रवाद-पर्व' में प्रतीकात्मक रूप से प्रतिपादित तथ्य प्रासंगिक बन जाता है।

मुख्य शब्द : प्रवादपर्व, काव्यात्मकता, लोकतांत्रिक शासन व्यवस्था, लोकतांत्रिक नैतिकता, अप्रत्यक्ष-लोकतंत्र आदि।

भारत के राजनैतिक उथल-पुथल के इतिहास के संदर्भ में 'प्रवाद-पर्व' नामक काव्य-रचना प्रासंगिक होने का प्रमाण नरेश मेहताजी के शब्दों से अंकित किया जा सकता है। "यह जून 1975 में लिखी गयी और उसके तत्काल बाद आपात-स्थिति की घोषणा के कारण मुद्रित हो जाने के बाद भी प्रकाशित न हो सकी। एक समय यह भी लगा कि यदि 'राज्यकृपा' को इसके मुद्रण की गन्ध भी मिल गयी तो संभव है कि यह कभी प्रकाशित रूप में सामने ही न आए।" (प्रवादपर्व, पृष्ठ-14) इस काव्य-पुस्तक के 'काव्यात्मकता और काव्य-भाषा की भूमिका' नामक आमुख के अंत में दिए गए उपर्युक्त शब्दों में मेहता जी ने आपातकाल की विशेष परिस्थिति में 'अभिव्यक्ति की स्वतंत्रता' पर शासन द्वारा लगाई गयी 'सेंसरशिप' की भीषणता का जिक्र किया है।

आपात स्थिति और अभिव्यक्ति की स्वतंत्रता : लोकतांत्रिक शासन व्यवस्था में मूल-अधिकारों की घोषणा एवं संरक्षण भारतीय संविधान की विशेषता है, लेकिन उन अधिकारों पर आवश्यकता पड़ने पर निर्बंधन लगाने के उपबंध भी संविधान में शामिल किये गये हैं। भारत एक प्रभुत्व-सम्पन्न गणराज्य है, इस प्रभुत्व सम्पन्नता की रक्षा करना एक संवैधानिक दायित्व है। विश्वास है कि मतदाता लोगों के हाथों में भारत की संप्रभुता अक्षुण्ण होकर आगे चलती है। आजादी के बाद भारत के लोग अपने सामाजिक एवं राजनैतिक जीवन को व्यवस्थित करने में और लोकतांत्रिक नैतिकता का पालन करने में संविधान का आश्रय लेते हैं। इतिहास साक्षी है कि अप्रत्यक्ष-लोकतंत्र के निर्वाचन प्रक्रिया में जनता द्वारा चुने हुए शासकों की अदूरदर्शिता एवं सतर्कता की कमी के फलस्वरूप हमारा लोकतंत्र कभी कभी चरमराते हुए भी देखा है। कारण यह है कि भारतीय परिसंघ की सरकार आंतरिक तथा बाह्य मामलों में अपनी इच्छानुसार आचरण करने के लिए पूर्ण स्वतंत्र है। इसलिए देश की संप्रभुता की रक्षा करने का दायित्व भी परिसंघीय सरकार के क्षेत्राधिकार के अंतर्गत है। भारत के परिसंघीय सरकार ने देश की सुरक्षा एवं संप्रभुता के नाम पर संविधान के 'आपात उपबंध' के उपयोग एक से अधिक बार किये हैं।

भारतीय संविधान के भाग 18 में उल्लिखित आपातों के प्रकार हैं कि 1. अनुच्छेद 352 के अनुसार युद्ध या बाह्य आक्रमण या सशस्त्र विद्रोह से उत्पन्न आपात, 2. अनुच्छेद 356 के अनुसार राज्यों में संवैधानिक तंत्र विफल होने से उत्पन्न आपात और 3. अनुच्छेद 360 के अनुसार वित्तीय स्थायित्व संकट में पड़ जाने से उत्पन्न आपात। यहाँ हमारा विचाराधीन विषय 'अभिव्यक्ति की स्वतंत्रता' है इसलिए अनुच्छेद 352 से संबन्धित 'राष्ट्रीय आपात' की चर्चा करना उचित है। "352 आपात की उद्घोषणा—(1) यदि राष्ट्रपति का यह समाधान हो जाता है कि गंभीर आपात विद्यमान है जिससे युद्ध या बाह्य आक्रमण या (सशस्त्र विद्रोह) के कारण भारत या उसके राज्यक्षेत्र के किसी भाग की सुरक्षा संकट में है तो वह उद्घोषणा द्वारा, संपूर्ण भारत या उसके राज्यक्षेत्र के ऐसे भाग के संबन्ध में जो उद्घोषणा में विनिर्दिष्ट किया जाए, इस आशय की घोषणा कर सकेगा।" (भारत का संविधान 1 सितंबर 1991 को यथा विद्यमान, पृष्ठ 9)

यह ध्यान देने योग्य है कि जब राष्ट्रपति द्वारा 'राष्ट्रीय आपात की घोषणा' होती है तब अनुच्छेद 358, "आपात के दौरान अनुच्छेद 19 उपबंधों का निलंबन" प्रवर्तन में आता है। अनुच्छेद 19 के प्रथम खण्ड के उपखण्ड (क) के अनुसार "सब नागरिकों को वाक्-स्वातंत्र्य और अभिव्यक्ति-स्वातंत्र्य का अधिकार होगा" (पृष्ठ 6 भारत का संविधान)। अर्थात् हमारी लोकतांत्रिक शासन-प्रणाली में हर व्यक्ति को अपने विचारों को अभिव्यक्त करने का और दूसरों के विचारों की जानकारी लेने का अधिकार होता है। अनुच्छेद 19(1) (क) में जानने का अधिकार भी शामिल है। डॉ० जयनारायण पाण्डेय के शब्दों में "वाक् और अभिव्यक्ति की स्वतंत्रता का अर्थ-शब्दों लेखों, मुद्रणों(Printing) चिह्नों या किसी अन्य प्रकार से अपने विचारों को व्यक्त करना।.....विचारों को व्यक्त करने के जितने भी माध्यम हैं वे 'अभिव्यक्ति' पदावली के अन्तर्गत आ जाते हैं।" (भारत का संविधान, डॉ० जयनारायण पाण्डेय, पृ० 143) कहने का तात्पर्य यह है कि आपातकाल के दौरान अनुच्छेद 19 के निलंबन से भारतीय नागरिक संविधान में प्रदत्त सब मूल-भूत अधिकारों एवं वैयक्तिक स्वतंत्रताओं से वंचित हो जाते हैं। इन वैयक्तिक स्वतंत्रताओं में सबसे प्रमुख है वाक्-स्वातंत्र्य और अभिव्यक्ति की स्वतंत्रता। स्वतंत्र समाज में अंतिम भलाई, सच्चाई को जानने में निहित होती है, विचारों के मुक्त आदान-प्रदान से यह संभव हो सकता है। भारत में संवैधानिक कार्यवाही के तौर पर हुई 'आपात की उद्घोषणा' का छोटा-सा विवरण देना संगत होगा।

भारत में आपातकाल : अनुच्छेद 352 का सर्वप्रथम प्रयोग राष्ट्रपति ने 26 अक्टूबर 1962 में किया जब कि भारत पर चीन का आक्रमण हुआ। राष्ट्रीय आपात की दूसरी उद्घोषणा 1971 में हुई। इसका कारण बाह्य आक्रमण था यानि पाकिस्तान ने भारत के विरुद्ध एक अघोषित युद्ध प्रारंभ किया था। 26 जून 1975 को राष्ट्रपति ने आपात की तीसरी उद्घोषणा की। पहली और दूसरी आपात



Tailoring the properties of zinc oxide films by incorporating gold nanoparticles using RF magnetron sputtering

R. Sreeja Sreedharan¹ · V. S. Kavitha¹ · S. Suresh¹ · R. Reshmi Krishnan¹ · R. Jolly Bose¹ · V. P. Mahadevan Pillai¹

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Abstract

Nanoscale noble metal-incorporated ZnO nanostructures can have potential applications in developing chemical and biological sensors, optical filters, ultrafast switching devices, etc. The structural, morphological and optical properties of the as-deposited pure and Au-incorporated RF-sputtered ZnO films were investigated. XRD analysis suggests that the presence of Au nanoparticles strongly promotes the growth of well-crystalline grains of ZnO along (001) direction. Surface morphology examined using AFM and FESEM micrographs and compositional analysis using EDX spectra reveal that Au acts as a nucleating center for the growth of high-crystalline grains, leading to the formation of specific structures. The observed reduction in transmittance with Au incorporation concentration can be attributed to LSPR of gold nanoparticles, scattering, increased surface roughness and increased thicknesses of the films. Systematic increase in the intensity of the plasmonic peak along with a shift in its position towards longer wavelength region is observed with increase in Au incorporation concentration. The PL spectra of the films show a NBE emission due to excitonic transition in ZnO and blue emission originating from deep-level defects in ZnO. The influence of Au nanoparticles on the crystallization of ZnO grains, evolution of surface morphology of ZnO nanostructured films and modification in the UV emission efficiency of ZnO films due to SPR of Au nanoparticles are studied in detail.

1 Introduction

Study of nanoobjects with different possible structures and shapes such as nanodots, nanopillars, nanorods, [1, 2] nanoneedles, nanotubes [3, 4], nanospirals, nanoprisms [5], nanoflowers [6–8] nanocups, and nanodonuts [9] is a vast and fascinating area of research. Nanowires [10], nanobelts, [11] and nanorods [12] are the most extensively studied 1D-nanostructures due to their potential applications in multifunctional nanodevices such as ultraviolet nanolasers and nanosensors [13, 14]. The grains of ZnO take different shapes depending on the preparation methods and post-deposition treatment. Chemical-vapor deposition (CVD) [15, 16], thermal evaporation [17] and hydrothermal methods [18–21] are the common techniques used for the synthesis of ZnO nanostructures. Catalyst, fabrication temperature, reaction time, etc. have strong influence on the morphology of the ZnO nanostructures [22–24]. Incorporation of dopants

is another interesting factor that can be used to tune the morphology of nanostructured materials. Illyaskutty et al. demonstrated that the incorporation of ZnO plays a crucial role in the evolution of morphology of MoO₃ nanostructures from nanorods to nanowires, nanobelts and to nanotubes with change in the ZnO incorporation concentration [25]. Au–semiconductor hybrid nanomaterials become an active area of research because of their remarkable optical, electrical, and catalytic properties [26–29]. In comparison with other semiconductor nanostructures, the synthesis of Au–ZnO hybrid nanostructures has achieved only limited success [30]. Nanoscale noble metal-incorporated ZnO nanostructures can have potential applications in developing chemical and biological sensors [31–33], optical filters [34] and ultrafast switching devices [35, 36] due to their localized surface plasmonic resonance absorption of light. Even though gold is one of the most chemically inert metals and poor catalyst in the bulk form, Au nanoparticles exhibit interesting catalytic properties at room temperature [37].

Nanoscale noble metals such as gold (Au) and silver (Ag) show interesting absorption and luminescence properties due to strong localized surface plasmon resonance (LSPR) [38]. SPR property of Au nanoparticles is an interesting area of

✉ V. P. Mahadevan Pillai
vpmpillai9@gmail.com

¹ Department of Optoelectronics, University of Kerala,
Kariavattom, Thiruvananthapuram, Kerala 695581, India



TECHNICAL ARTICLE

Highly Ordered Good Crystalline ZnO-Doped WO₃ Thin Films Suitable for Optoelectronic Applications

V.S. KAVITHA,¹ R. JOLLY BOSE,¹ R. SREEJA SREEDHARAN,¹
C. SUDARSANAKUMAR,² RADHAKRISHNA PRABHU,³
and V.P. MAHADEVAN PILLAI^{1,4}

1.—Department of Optoelectronics, University of Kerala, Kariavattom, Thiruvananthapuram, Kerala 695581, India. 2.—School of Pure and Applied Physics, Mahatma Gandhi University, Priyadarsini Hills, Kottayam, Kerala 686560, India. 3.—School of Engineering, Robert Gordon University, Aberdeen, UK. 4.—e-mail: vppillai9@gmail.com

Highly ordered ZnO-doped WO₃ thin films with good crystalline quality are prepared using radio frequency magnetron sputtering technique, and its morphological and structural properties are studied using various characterization tools such as field emission scanning electron microscopy, energy-dispersive x-ray spectroscopy, x-ray diffraction technique, micro-Raman spectroscopy, and x-ray photoelectron spectroscopy. Morphological analysis shows a smooth surface for pure film, whereas the ZnO-doped films presents a dense distribution of grains of larger sizes with well-defined grain boundary. X-ray diffraction studies reveal the enhancement of crystalline quality of the films with increase in ZnO doping concentration up to 5 wt.%, beyond which the crystalline quality gets deteriorated. A phase modification from a single monoclinic WO₃ phase to mixed monoclinic WO₃ and W₁₈O₄₉ phases is observed for films with higher ZnO doping concentrations.

INTRODUCTION

Tungsten trioxide (WO₃) is an important semiconductor oxide material showing a broad spectrum of novel properties.¹ It shows structural and stoichiometric transitions upon change in conditions that fascinated scientists to explore their future technological applications in different fields.^{2,3} Since structural and morphological properties of nanomaterials show a vital role in device performance, the designing of nanomaterials is a crucial problem when technological applications are concerned.⁴ From an application point of view, it is utmost desirable to synthesize highly crystallized nanomaterial thin films by controlling their structural and morphological properties. WO₃ thin films are better known for their important physiochemical properties, which make them a suitable candidate in catalysis, gas sensors, electro-chromic devices, etc.^{5–7} The structural and morphological properties of WO₃ thin films (at sub-micrometric scale) have profound effects on its physiochemical properties, which strongly depends on its preparation methods and conditions.⁸ WO₃ thin films have been prepared by many groups

through different techniques like chemical vapor deposition,⁹ RF magnetron sputtering,¹⁰ solvothermal process,¹¹ electrodeposition,¹² sol-gel processes,¹³ hydrothermal techniques,¹⁴ atomic layer deposition,¹⁵ pulsed laser deposition technique,^{16,17} etc. Among this radio frequency (RF) magnetron sputtering technique is relatively simple, and one can grow homogeneous, high-quality thin films of larger area suitable for device applications. Here we report the fabrication of ZnO-doped WO₃ thin films of superior crystalline quality using RF magnetron sputtering technique and its morphological and structural studies using different techniques such as field emission scanning electron microscopy (FESEM), energy-dispersive x-ray spectroscopy (EDX), x-ray diffraction (XRD), micro-Raman spectroscopy, and x-ray photoelectron spectroscopy (XPS).

EXPERIMENT

ZnO-doped tungsten oxide thin films were prepared using the RF magnetron sputtering technique from sputtering targets made of WO₃ powder

Foiling Keylogger Attacks using Virtual Onscreen Keyboard

Jayalekshmi K.S

M.Tech in Computer Science and Engineering, UGC NET Scholar, Thiruvananthapuram, India

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Abstract—Key loggers are hardware or software tools designed to record user’s keyboard strokes. They are a threat during authentication as they can capture important information from the target computers through secret installation. They are largely undetected by most anti-virus software. To prevent key logger attacks, virtual on-screen keyboard with random keyboard arrangement is used. Unfortunately, the key loggers have improved tremendously. They take control of the personal computer and can capture every event and read the video buffer. By using cryptographically strong keys and passwords information can be delivered securely to the user’s computer. But humans may not have sufficient memory to remember cryptographically strong keys. This can be solved by introducing an intermediate device that bridges humans and user terminal. The proposed authentication scheme is a password-based authentication method using a randomized onscreen keyboard. The scheme utilizes a smartphone as the intermediate device which contains the keys required for decryption. The encrypted contents are encoded into QR (Quick Response) codes. QR codes can be scanned using the smartphone. The user owns a user id and a password. The user terminal will display a blank keyboard and the QR code which carries the encrypted random permutation of keyboard arrangement. The QR code will be decoded using the intermediate device. Looking at the keyboard arrangement in the intermediate device the user needs to click the buttons on the blank keyboard to input the password. The use of IMEI (International Mobile Equipment Identity) of the smartphone prevents the attackers from using any other phones for authentication even if he knows the user-id, password and the key for decryption.

Keywords— QR code, password based authentication, smartphone, IMEI

I. INTRODUCTION

Spyware attacks have become one among the greatest threats to enterprise security [1]. They have resulted in extracting sensitive information from the target computer. The use of textual passwords for authentication is common today. But the stealing of textual passwords has become a common occurrence due to spyware attacks. Keyloggers are capable of residing in systems by sharing the system resources with other legitimate programs for a long time. Keyloggers functionality have extended beyond recording keyboard characters. Some can function as screen scrapers which can take snapshots of screen periodically. These snapshots may contain credentials used for authentication. The use of virtual onscreen keyboards for authentication fails due to such key loggers

A key logger attack is similar to shoulder-surfing attack as a key logger can see the characters entered by the user. To prevent shoulder surfing attack, various graphical password methods have been introduced [2]. But they aren’t usable like textual passwords. Information could be delivered securely to the user’s computer by using cryptographically strong keys and passwords. But humans don’t have enough memory to memorize these keys. Therefore an intermediate device is used to store the keys.

A novel authentication protocol is proposed that can mitigate key logger attacks. A blank keyboard (no characters shown) will be displayed on the screen of the user terminal and the user authentication should be done using this keyboard. The full keyboard (with characters are shown) will be displayed on an intermediate device looking at which the user needs to input the credentials on the user terminal. The intermediate device used is a smartphone. The smartphone also stores cryptographically strong keys which are required to deliver the information securely. The user will have a user-id and a password. Initially the user will input the user-id. On the basis of the user-id received, a random permutation of the keyboard is generated and encrypted at the server. A QR (Quick Response) code is also generated which consists of the encrypted permutation of the keyboard. The QR code along with the blank keyboard is displayed on the user terminal screen. The user needs to use the smartphone to scan the QR code and decrypt the contents in the code. The full keyboard will be displayed on the intermediate device. Looking at the intermediate device, the user needs to input his/her password by clicking on the buttons that corresponds to the password of the user on the user terminal. To ensure that the user is using his/her smartphone to scan the QR code the IMEI (International Mobile Equipment Identity) of the phone is verified.

ORIGINAL ARTICLE

Mechanism of protection of rat hepatocytes from acetaminophen-induced cellular damage by ethanol extract of *Aerva lanata*

Chithambaram Sujatha ANUSHA¹, Hariharan SINI², Bhaskara PRAKASHKUMAR¹, Kottayath Govindan NEVIN¹

¹ School of Biosciences, Mahatma Gandhi University, PD Hills PO, Kottayam, 686560 Kerala, India

² Department of Biochemistry, Government College Kariavattom, Thiruvananthapuram, 695581 Kerala, India

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ABSTRACT

The aim of this study is to evaluate the protective effect of ethanol extract of *Aerva lanata* (EEAL) in preventing acetaminophen induced liver toxicity. EEAL was prepared and its hepatoprotective effect was studied in both isolated primary hepatocytes *in vitro* and in Sprague Dawley rats *in vivo*. For *in vivo* studies, the animals were grouped as Group I – Control; Group II – ACN (2 g/kg b.w.); Group III – EEAL (50 mg/kg b.w.) + ACN (2 g/kg b.w.), Group IV – EEAL (100 mg/kg b.w.) + ACN (2 g/kg b.w.). Extracellular activities of the enzymes liver aminotransferase (GOT, GPT), alkaline phosphatase (ALP) and lactate dehydrogenase (LDH) in isolated hepatocytes and rat plasma were studied colorimetrically. Expression of GST, Nrf2, COX 1 & COX2 genes in rat liver were evaluated by RT-PCR. The results showed that ACN induced down-regulation of Nrf2 and upregulation of GST gene expression, which were modulated by EEAL treatment. GOT, GPT, ALP and LDH levels were found to be lowered in both hepatocyte culture media and plasma following EEAL treatment. In addition, the medium GOT and GPT levels were diminished following EEAL treatment only. Moreover, only ALP and LDH in serum appeared to be at normal level following EEAL treatment, whereas GOT and GPT showed levels lower than control. ACN treatment increased the expression of pro-inflammatory COX 1 and COX 2 genes and the levels of these genes were reduced by EEAL treatment. EEAL pre-treated rats exposed to ACN were found to retain normal hepatic structure compared to ACN alone treated rats. From these results it can be concluded that ethanol extract of *A. lanata* possesses both anti-inflammatory and hepatoprotective activity.

KEY WORDS: *Aerva lanata*; hepatotoxicity; Nrf2; cyclooxygenases; acetaminophen

Introduction

Parenchyma and non-parenchyma cells of the liver are involved in several functions which regulate the homeostasis of our body. The presence of chemical and/or biological toxins causes severe damage to the liver leading to hepatitis and cirrhosis mediated through lipid peroxidation and other oxidative complex reactions (Kumar *et al.*, 2011). Severe lipid peroxidation induced by continuous oxidative stress triggered by oxidants is one of the major attributes to the initiation and progress of liver damage (Albano *et al.*, 1985). Hepatic injury and subsequent hepatic failure due to overdose of acetaminophen (ACN) is a serious health concern (Yoon *et al.*, 2016). Under

conditions of ACN overdose, the glucuronidation and sulfation process become saturated and more extensive bioactivation of ACN to *N*-acetyl-*p*-benzoquinone imine (NAPQI) occurs, which covalently binds to produce cellular protein adducts, leading to liver failure (Jollow *et al.*, 1973). This evidence suggests that removal and/or deactivation of agents creating oxidative stress is a protective mechanism against the development of ACN hepatotoxicity. Thus, components of natural origin, i.e. detoxifying enzymes that contribute to enhance intracellular antioxidant potential are important in the protection or treatment of such injury. Though many synthetic drugs/natural preparations are now available in the market for treating liver damage, they all have been found to have some toxic side effects. Thus the development of effective drugs with lower toxicity is required. Plant derived components/products always have a potential role in the research of medicine and pharmacology. There are several plant species that are considered to have significant hepatoprotective effects in animal model (Kumar *et al.*, 2011).

Correspondence address:

Dr. Kottayath Govindan Nevin

School of Biosciences, Mahatma Gandhi University

PD Hills PO, Kottayam, 686560 Kerala, India

TEL: 9645631807 • E-MAIL: nevinkg@gmail.com



Research
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Core Metabolic Features and Hot Origin of Bathyarchaeota

Xiaoyuan Feng^a, Yinzhaoh Wang^a, Rahul Zubin^a, Fengping Wang^{a,b,*}

^aState Key Laboratory of Microbial Metabolism, School of Life Sciences and Biotechnology, Shanghai Jiao Tong University, Shanghai 200240, China

^bState Key Laboratory of Ocean Engineering, Shanghai Jiao Tong University, Shanghai 200240, China



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ABSTRACT

The archaeal phylum Bathyarchaeota comprises highly diversified subgroups and is considered to be one of the most abundant microorganisms on earth. The metabolic features and evolution of this phylum still remain largely unknown. In this article, a comparative metabolic analysis of 15 newly reconstructed and 36 published metagenomic assembled genomes (MAGs) spanning 10 subgroups was performed, revealing the core metabolic features of Bathyarchaeota—namely, protein, lipid, and benzoate degradation; glycolysis; and the Wood–Ljungdahl (WL) pathway, indicating an acetyl-CoA-centralized metabolism within this phylum. Furthermore, a partial tricarboxylic acid (TCA) cycle, acetogenesis, and sulfur-related metabolic pathways were found in specific subgroups, suggesting versatile metabolic capabilities and ecological functions of different subgroups. Intriguingly, most of the MAGs from the Bathy-21 and -22 subgroups, which are placed at the phylogenetic root of all bathyarchaeotal lineages and likely represent the ancient Bathyarchaeota types, were found in hydrothermal environments and encoded reverse gyrase, suggesting a hyperthermophilic feature. This work reveals the core metabolic features of Bathyarchaeota, and indicates a hot origin of this archaeal phylum.

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1. Introduction

The archaeal phylum Bathyarchaeota (formerly known as Miscellaneous Crenarchaeotal Group (MCG)) is one of the most abundant and ubiquitously distributed microorganisms living in diverse habitats such as marine/freshwater sediment, soil, bioreactor, animal-associated habitats, and the deep subsurface biosphere [1–5]. They are considered to actively participate in global geochemical cycling, particularly in the transformations of carbon [6,7]. Several studies have suggested an acetyl-CoA-centralized heterotrophic lifestyle in the Bathyarchaeota [4,8], and have found that they hold the potential to degrade proteins [2] and aromatic compounds [3,4], and to hydrolyze extracellular carbohydrates [9,10]. A recent breakthrough showed that Bathyarchaeota were able to utilize lignin while fixing carbon dioxide (CO₂); this finding was the first evidence for anaerobic lignin degradation in the domain Archaea [11]. Furthermore, several bathyarchaeotal lineages have been suggested to have potential for methane metabolism [12] and acetogenesis [4], two of the most fundamental and ancient microbial biochemical energy-conservation processes

[13]. The above mentioned metabolic pathways of Bathyarchaeota may actively interact with local microbes [4] and drive the cycling of other elements such as nitrogen and sulfur [9,10].

Phylogenetic analysis based on 16S rRNA gene sequences revealed a large intragroup diversity (Bathy-1 to -19), which was recently enlarged further to 25 subgroups [8]. These subgroups have versatile physiological capabilities and possess distinct ecological niches [1,14]. Previous research has demonstrated that the diversification of Bathyarchaeota subgroups may have been influenced by several saline–freshwater transition events [14]. However, the ecological role, origin, and evolution of Bathyarchaeota are still far from fully understood. It remains unclear whether this diverse archaeal phylum contains core metabolic features, and how this phylum originates and evolves. In this study, we analyzed bathyarchaeotal 16S rRNA genes from two newly sequenced Guaymas Basin sediment samples and from public databases. With new binned and downloaded bathyarchaeotal metagenomic assembled genomes (MAGs), a comprehensive comparative analysis of 51 out of 60 MAGs spanning 10 subgroups was performed. The results indicate that the phylum Bathyarchaeota shares a core set of metabolic pathways, including protein degradation, glycolysis, and the reductive acetyl-CoA (Wood–Ljungdahl, WL) pathway. Furthermore, our data suggests a hot origin for

* Corresponding author.

E-mail address: fengpingw@sjtu.edu.cn (F. Wang).

FAULT DETECTION OF CONSTRAINED OBJECT MODELS USING OBJECT MODELING TECHNIQUES

Priya R

Assistant Professor

Department of Computer Science, Government College

Kariavattom, Trivandrum 695 581, Kerala, India

priyanil2007@gmail.com

Abstract - This paper proposes a new efficient methodology for fault detection from the structural modeling of a complex system using the UML class diagram. The crisp and precise constraints on the attributes and relationships are represented using the formal specification language, Object Constraint Language (OCL). Model verification is done by converting the model to Constraint Satisfaction Problem(CSP) and by solving the problem. Performance is analysed by both bounded and unbounded validation.

Keywords: Complex system; constraints; model verification.

1. Introduction

Object Modeling Technique (OMT), developed by Rumbaugh *et al.* in 1991 is an object modeling approach using objects and their behaviour, which helps to reduce the complexity in developing a complex system. The purpose of OMT is mainly testing physical entities before building them by simulating the object model, dynamic model and functional models. OMT also helps to visualize the system so that the complexity involved in building the system can be reduced by using Unified Modeling Language (UML) which is a standardized modeling language enabling developers to specify, visualize, construct and document artifacts of a software system.

Class diagram, which is a structural UML diagram focuses on the static aspects of the system. Class diagrams typically specify the main elements of the entities of the system, but fail to provide all the relevant aspects of the specification. Designers usually need to add constraints to the model to cater to this weakness of class diagrams. These constraints are often described in natural language. However, constraints written using natural language inevitably lead to ambiguities, and hence Object Constraint Language (OCL), which is a formal specification language developed by IBM, could be employed. OCL offers three types of constraints on class diagrams with a fourth constraint offering the user the ability to extend the class diagram. They are *Pre-condition*, *Post-condition*, *Invariant* and *Definition*.

Modeling of complex systems is relevant since a complex system consists of many components, with numerous relationships and interactions between these components and the components will be linked through many dense interconnections and they cannot be described by a single rule and their characteristics are not reducible to one level of description. This complexity leads to many errors that may creep in during modeling. This necessitates the Validation and Verification (V&V) of models. But, UML class diagrams annotated with OCL constraints is just a pictorial language used to make software blue prints and model verification and execution is not possible with the structural modeling of UML.

In this paper, a methodology is proposed to translate the Object oriented class diagram with its constraints to an intermediate representation where formal verifications could be performed. Formal validations are also employed on the class diagram before code generation, which would enable to develop robust systems.

The proposed methodology is implemented in a constrained complex system of Tamil Nadu Tuticorin Power System (TTPS). The thermal power plant is a complex system with many sub-systems. Constraints are defined for intra class invariants, for inter class invariants and multiplicity constraints. The functional behaviour of the constrained objects is defined and tested with instance values that are validated against the constrained system. Some of the critical situations like cause of alarms, tripping cases of thermal plant are also validated using the OCL based constrained system. The attribute instances of the constrained objects are generated using CSP. Through XML Meta data Interchange (XMI), which is intended to help programmers to exchange data models, a better framework for modeling of any complex system is provided.



Apolipoprotein E Polymorphism and Oxidative Stress in Peripheral Blood-Derived Macrophage-Mediated Amyloid-Beta Phagocytosis in Alzheimer's Disease Patients

P. S. Jairani¹ · P. M. Aswathy¹ · Dhanya Krishnan² · Ramsekhar N. Menon¹ · Joe Verghese³ · P. S. Mathuranath^{1,4} · Srinivas Gopala²

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Abstract

Peripheral blood-derived macrophages isolated from Alzheimer's disease (AD) patients have earlier been reported to demonstrate ineffective phagocytosis of amyloid-beta compared to the age-matched control subjects. However, the mechanisms causing unsuccessful phagocytosis remain unclear. Oxidative stress and the presence of ApoEε4 allele has been reported to play a major role in the pathogenesis of AD, but the contribution of oxidative stress and ApoEε4 in macrophage dysfunction leading to ineffective Aβ phagocytosis needs to be analyzed. Aβ phagocytosis assay has been performed using FITC-labeled Aβ and analyzed using flow cytometry and confocal imaging in patient samples and in THP-1 cells. Oxidative stress in patient-derived macrophages was analyzed by assessing the DNA damage using comet assay. ApoE polymorphism was analyzed using sequence-specific PCR and Hixson & Vernier Restriction isotyping protocol. In this study, we have analyzed the patterns of phagocytic inefficiency of macrophages in Indian population with a gradual decline in the phagocytic potential from mild cognitive impairment (MCI) to AD patients. Further, we have shown that the presence of ApoEε4 allele might also have a possible effect on the phagocytosis efficiency of the macrophages. Here, we demonstrate for the first time that oxidative stress could affect the amyloid-beta phagocytic potential of macrophages and hence by alleviating oxidative stress using curcumin, an anti-oxidant could enhance the amyloid-beta phagocytic efficacy of macrophages of patients with AD and MCI, although the responsiveness to curcumin might depend on the presence or absence of APOEε4 allele. Oxidative stress contributes significantly to decreased phagocytosis of Aβ by macrophages. Moreover, the phagocytic inefficiency of macrophages was correlated to the presence of ApoEε4 allele. This study also found that the Aβ-phagocytic potential of macrophage gets significantly enhanced in curcumin-treated patient-derived macrophages.

Keywords Alzheimer's disease · Mild cognitive impairment · Phagocytosis · Internalization · Colocalization · Amyloid beta · Macrophages · Monocytes · Curcumin · APO E

P. S. Jairani and P. M. Aswathy are equal first authors.

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✉ Srinivas Gopala
srinivasg@sctimst.ac.in

P. S. Mathuranath
psmathu@yahoo.com

¹ Cognition & Behavioral Neurology Section, Department of Neurology, Sree Chitra Tirunal Institute for Medical Sciences & Technology (SCTIMST), Thiruvananthapuram, Kerala, India

² Department of Biochemistry, Sree Chitra Tirunal Institute for Medical Sciences & Technology (SCTIMST), Thiruvananthapuram, Kerala 695011, India

³ Department of Neurology, Albert Einstein College of Medicine, New York, NY, USA

⁴ Present Address: Department of Neurology, National Institute of Mental Health & Neuro Sciences (NIMHANS), Bangalore, India