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Rich Dynamical Behavior in a Simple Chaotic Oscillator Based on Sallen Key High-Pass Filter

Saumen Chakraborty[1] · **Saumendra Sankar De Sarkar**[2]

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Abstract

A chaotic oscillator has been designed based on a Sallen Key-type high-pass filter (HPF). The HPF has been converted to a chaotic oscillator using a parallel combination of a PN junction diode as a nonlinear element and an inductor as an energy storage element. The dynamics of the proposed system has been simulated numerically using fourth-order Runge–Kutta method. The circuit exhibits period-doubling route to chaos as well as period-adding route to chaos depending on the choice of system parameters. Striking features like antimonotonicity and coexistence of attractors are also observed. Bifurcation diagram, phase plane plots and spectrum of Lyapunov exponents have been employed to describe the chaotic behavior of the system. A hardware experiment has been carried out to verify the same in the laboratory using off-the-shelf components.

Keywords High-pass filter · Diode–inductor composite · Chaotic oscillator · Period-adding and period-doubling bifurcation · Antimonotonicity · Coexisting attractors

List of Symbols

C	Capacitor
R_1, R_2, R_a, R_b	Resistor
V_1, V_0	Voltage
k	$R_1/2R_2$
ω_0	Frequency of oscillation

✉ Saumendra Sankar De Sarkar
ssdesarkar@gmail.com

Saumen Chakraborty
saumenbcc@gmail.com

[1] Department of Physics, Bidhan Chandra College, Asansol 713304, West Bengal, India

[2] Department of Physics, Raniganj Girls' College, Searsole Rajbari 713358, West Bengal, India

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Tris chelated meridional isomers of Co(III) complexes: Synthesis, crystal structure, protein binding, cytotoxicity studies and DFT/TDDFT calculation

Dama Saren [a], Susobhan Das [a], Aparup Paul [a], Sharad S. Tat [b], Manas Kumar Santra [b], Tapan Kumar Si [c], Horst Puschmann [d], Subal Chandra Manna [a,*]

[a] Department of Chemistry, Vidyasagar University, Midnapore 721102, West Bengal, India
[b] National Centre for Cell Science, NCCS Complex, Pune University Campus Ganeshkhind, Pune 411 007, Maharashtra, India
[c] Department of Chemistry, Bidhan Chandra College, Asansol 713304, West Bengal, India
[d] Department of Chemistry, University of Durham, South Road, Durham DH1 3LE, UK

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ABSTRACT

Two mononuclear Co(III) complexes, $[Co(L^1)_3]$ (**1**) and $[Co(L^2)_3]$ (**2**) (HL^1, 2-[(2-methoxy-ethylimino)-methyl]-phenol; HL^2, 1-[(2-methoxy-ethylimino)-methyl]-naphthalen-2-ol) have been synthesized and characterized by X-ray crystal structure determination, IR and mass spectroscopic techniques. Both the complexes are mononuclear with distorted octahedral geometries and the Co(III) center are coordinated with three bidentate (O, N) Schiff base ligands. Complexes **1** and **2** form 1D and 3D supramolecular structures, respectively, with weak C—H…π interactions. Experimental UV–vis absorption spectra have been compared with the results obtained from DFT / TD-DFT calculation using B3LYP functional and LanL2DZ basis set. The interaction of the complexes with bovine serum albumin (BSA) and human serum albumin (HSA) were studied using electronic absorption and fluorescence spectroscopic methods and the results show that complexes potentially quench the fluorescence of BSA/HSA through ground state association mechanism. Cytotoxicity studies of these complexes have been performed against breast cancer cell lines and found that they have moderate anticancer activity.

1. Introduction

First row transition metals play important role in the biological system and among them cobalt plays a vital role as for example, cobalt (III) is an important component of vitamin B_{12} co-enzyme. Generally, the oxidation states of cobalt are +2 and +3 in coordination compounds and play an important role for their potential biological activities [1] and also they can potentially be used in catalysts [2], luminescence [3] and functional materials [4].

Multi-dentate Schiff base ligands are potentially used for the synthesis of 3d, 3d/lanthanoid metal-based coordination compounds [5].

The Schiff base coordinated compounds are biologically important because of their antifungal [6], antibacterial [7], anticancer [8], antimicrobial [9], antioxidant activities [10], etc.

A literature survey shows that Schiff-base coordinated cobalt compounds are also potentially used as cytotoxic agents [11].

In the circulatory system serum albumins (SAs) take parts in many physiological processes and show a vital role for transport of many exogenous and endogenous compounds [12]. High binding ability of serum albumins (SAs) with metal complexes was reported in the literature Human serum albumin (HSA) and bovine serum albumin (BSA) are widely used for the study of binding affinity with metal complexes and to explore the mechanism of interaction.

Density functional theory (DFT) is a widely used as computational technique to explicate the molecular structure, electronic, and spectroscopic properties of 3d metal complexes [13]. Electronic absorbance spectral properties of the complexes can be explained by time-dependent density functional theory (TD-DFT) [14].

The present manuscript reports the synthesis, crystal structure, DFT/TD-DFT calculation, photophysical property, and protein binding activity of two mononuclear cobalt(III) complexes. The electronic spectral properties of complexes were explained by the results of DFT/TDDFT computation and the interaction of complexes with serum albumins was studied using electronic absorption and fluorescence spectroscopic techniques. The cytotoxicity studies of the two complexes have also been executed using breast cancer cell lines MCF7 and MDA-MB-231.

* Corresponding author.
E-mail address: scmanna@mail.vidyasagar.ac.in (S.C. Manna).

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Moral Dogma and Ethical Relativity in Joseph Conrad's *Almayer's Folly*

Subhadeep Ray[a] and Goutam Karmakar[b]

[a]Kazi Nazrul University; [b]University of the Western Cape

ABSTRACT

This paper studies the intricate treatment of the abstract and dogmatic order of imperial, racial, and religious morality, and the issue of ethical commitment in the concrete and fleeting relationships between individual subjects in Joseph Conrad's debut novel, *Almayer's Folly* (1895). The novel is set in the Malay Archipelago, where the fading years of the imperial absolutism of Europe give way to conflicting trade and political interests. A pessimistic philosophical outlook in Conrad's text shows how all the overindulgent narcissistic moral orders accommodate hate and self-interest motivated conspiracy, and simultaneously violate ethical demands of the Other in human contact.

KEYWORDS

Morality; ethics; other; empire; race

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Mothers and Daughters: Reclaiming the Besieged Body of Woman in Ashapurna Debi's Trilogy

Subhadeep Ray

Goutam Karmakar

Mothers and Daughters: Reclaiming the Besieged Body of Woman in Ashapurna Debi's Trilogy

By Subhadeep Ray[1] and Goutam Karmakar[2]

Abstract

This paper offers a close reading of the intergenerational trilogy by Ashapurna Debi, one of the first-canonized women-novelists of post-independence India: *Pratham Pratisruti* (*The First Promise*), 1965, *Subarnalata*, 1967, and *Bakul Katha* (*Bakul's Story*), 1974. Reconstituting a history of almost two centuries and countering the colonial/postcolonial grand narratives, these novels act as a saga of Bengali Hindu lower and middle-class women's plight under and resistance against a patriarchal social order operating at the most intimate levels of domestic relationships. Ashapurna Debi's treatment of the intricacies of gender inequality and a woman's response to the violence inflicted on her body in one of the centres of South-Asian modernity and its vicinity intervenes crucially in the twentieth century feminist discourse. At the same time, her narrative closely follows a promise, accompanied by a sense of commitment and responsibility, handed over from mother to daughter to granddaughter to rise as self-conscious individual subjects by overcoming personal and social reservations and taboos. This paper, therefore, examines the micro-physics of power exercised in gender relations as evident in the concerned trilogy. It focuses on the performing bodies of women amidst all sorts of physical and psychological oppressions and how they provide a critique of the broader aspects of social change, like reform and nationalist movements. While considering the intersections between the poststructuralist gender studies in the West—developed as a sustained critique of the mechanism of modern power being proposed by Michel Foucault among others—and Ashapurna Debi's observations, this paper theoretically emphasizes how the factors of

[1] Subhadeep Ray, Ph.D. (English), is presently an Associate Professor of English at Bidhan Chandra College, Kazi Nazrul University, Asansol, India. He is also Visiting Professor of English at Kazi Nazrul University, Asansol, India, and was the principal investigator of a UGC MRP on Popular Science Writing and Bengal Renaissance. He is a regular contributor to the Columbia University Press - UMCS Joseph Conrad Project, and Conrad: Eastern and Western Perspectives book series (UMCS & CUP). He works on the British and Bengali Modernist Fiction within the framework of Comparative Literature. His areas of interest are Modernism, Marxism, Postcolonialism, Disability studies, Poststructuralism, Translation studies, and Science Fiction. His publications include chapters in *Disability in Translation* (Routledge, 2020), and *Science Fiction in India* (Bloomsbury, 2022). He is the author of *Bengal Renaissance and Scientific Temper* (BlueRose, 2019), and editor of *Thirst* by Eugene O'Neill (Levant, 2005). He can be reached at subhadeep.ray.eng@gmail.com. ORCID ID: https://orcid.org/0000-0002-6663-8045

[2] Goutam Karmakar, Ph.D. (English), is an NRF Postdoctoral Fellow at the University of the Western Cape, South Africa. He is also an Assistant Professor of English at Barabazar Bikram Tudu Memorial College, Sidho-Kanho-Birsha University, Purulia, West Bengal, India. His forthcoming and recently published edited volumes are *Nation and Narration: Hindi Cinema and the Making and Remaking of National Consciousness* (Routledge, forthcoming), *The Poetry of Jibanananda Das: Aesthetics, Poetics, and Narratives* (Routledge, forthcoming), *Narratives of Trauma in South Asian Literature* (Routledge), *The City Speaks: Urban Spaces in Indian Literature* (Routledge, 2022), and *Religion in South Asian Anglophone Literature: Traversing Resistance, Margins and Extremism* (Routledge, 2021). He has been published in journals including *Intersections*, *Quarterly Review of Film and Video*, *Journal of Environmental Planning and Management*, *MELUS*, *South Asian Review*, *Journal of Graphic Novels and Comics*, *Interdisciplinary Literary Review*, *Journal of Gender Studies*, *Journal of Postcolonial Writing*, *National Identities*, *Nationalism and Ethnic Politics*, *Journal of Narrative and Language Studies*, *Asian Journal of Women's Studies*, and *Asiatic* among others. His research interests are South Asian Literature, Postcolonial Literature, Film Studies, Women and Gender Studies, and Ecological Studies. He can be reached at 4177972@myuwc.ac.za. ORCID ID: https://orcid.org/0000-0002-9119-9486.

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Disparity in Educational Participation in the Lenses of Educational Returns and Family Background: Evidence from India

Anjan Ray Chaudhury
Department of Economics, Durgapur Government College, India

Sreemanta Sarkar
Department of Economics, Bidhan Chandra College, Asansol, West Bengal, India

Madhabendra Sinha
Department of Economics, Bidhan Chandra College, Asansol, West Bengal, India.

Abstract

The paper attempts to investigate the origin of inequality in educational participation across Indian social groups in terms of inequality in the expected monetary educational returns and other demand-side factors responsible behind educational decision. We employ the binary logit model of regression for the accomplishment of the objective of this study. In addition, we decompose the discrepancy in educational participation into 'response effect' and 'attribute effect' to examine whether there is any discrimination in educational participation against the members of the disadvantaged social groups.

JEL Classification: I21, I24, I26

Keywords

Disparity, social groups, logistic regression, returns to education, educational participation

Introduction

The theories concerning human capital consider educational participation as an investment to increase lifetime income and wealth (Becker, 1975; Mincer, 1974; Schultz, 1975). A person requires bearing the cost to attain education which at the same time enables him to earn money in future.[1] A cost–benefit analysis is thus considered necessary before travelling into the world of education. The optimal choice depends on the equality of marginal benefit of one additional year of schooling to the marginal cost. All persons in a particular society may not be attracted to

Corresponding author:
Madhabendra Sinha, Department of Economics and Politics, Visva-Bharati University, Santiniketan, West Bengal 731235, India.
Email: madhabendras@gmail.com

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Plant type II arabinogalactan: Structural features and modification to increase functionality

Kanika Ghosh [a,**], Daisuke Takahashi [b], Toshihisa Kotake [b,c,*]

[a] Department of Chemistry, Bidhan Chandra College, Asansol, 713304, West Bengal, India
[b] Division of Life Science, Graduate School of Science and Engineering, Saitama University, 255 Shimo-Okubo, Sakura-ku, Saitama City, Saitama, 338-8570, Japan
[c] Green Bioscience Research Center, Graduate School of Science and Engineering, Saitama University, 255 Shimo-Okubo, Sakura-ku, Saitama City, Saitama, 338-8570, Japan

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ABSTRACT

Type II arabinogalactans (AGs) are a highly diverse class of plant polysaccharides generally encountered as the carbohydrate moieties of certain extracellular proteoglycans, the so-called arabinogalactan-proteins (AGPs), which are found on plasma membranes and in cell walls. The basic structure of type II AG is a 1,3-β-D-galactan main chain with 1,6-β-D-galactan side chains. The side chains are further decorated with other sugars such as α-L-arabinose and β-D-glucuronic acid. In addition, AGs with 1,6-β-D-galactan as the main chain, which are designated as 'type II related AG' in this review, can also be found in several plants. Due to their diverse and heterogenous features, the determination of carbohydrate structures of type II and type II related AGs is not easy. On the other hand, these complex AGs are scientifically and commercially attractive materials whose structures can be modified by chemical and biochemical approaches for specific purposes. In the current review, what is known about the chemical structures of type II and type II related AGs from different plant sources is outlined. After that, structural analysis techniques are considered and compared. Finally, structural modifications that enhance or alter functionality are highlighted.

1. Introduction

Most polysaccharides are derived from plant cell walls and considerable economic activity is concerned with the transfer of plant cell wall polysaccharides into various products, such as fuels, chemicals, and foods. Major constituents of plant cell walls are cellulose, hemicellulose, pectin, and lignin, but arabinogalactan-proteins (AGPs), a class of glycoprotein, are also commonly observed [1,2]. Arabinogalactans (AGs) form two main groups based on their structure: the arabino-4-galactans (1,4-β-D-galactans decorated with α-L-arabinose, α-L-Ara) are classified as type I AG and the arabino-3,6-galactans (1,3-β-D-galactan:1,6-β-D-galactan decorated with α-L-Ara) are classified as type II AG. While type I AGs usually link to the rhamnogalacturonan (RG) I backbone of pectin, type II AGs are generally found as the carbohydrate moieties of AGP, in which type II AGs account for more than 90% of their weight [3]. Acacia gum AG obtained from the acacia tree (*Acacia senegal*), also called gum arabic, and larch AG from larch wood (*Larix* species), are extensively utilized as gelling, emulsifying, and moisturizing agents in foods. In plants, type II AGs perform important functions in several physiological events such as differentiation, cell–cell recognition, embryogenesis, and programmed cell death [4,5], but the amount of type II AGs in cell wall is generally low. Due to difficulty in achieving large-scale production and low economic value, they are hardly utilized by humans.

Unlike other biological macromolecules like DNA and RNA helices (chains of nucleic acids) and proteins (chains of amino acids), polysaccharides (chains of monosaccharides) are not synthesized from a template or blueprint that determines the arrangement of their constituent sugar residues, which form branching, not single linear, chains. The monosaccharide units in oligosaccharides and polysaccharides can interconnect at several points to form a wide variety of branched or linear structures. Therefore, the structures of polysaccharides are heterogenous although some of them contain repetitive features. The chemical characterization of heterogenous polysaccharides is

* Corresponding author. Division of Life Science, Graduate School of Science and Engineering, Saitama University, 255 Shimo-Okubo, Sakura-ku, Saitama City, Saitama, 338-8570, Japan.
** Corresponding author.
E-mail addresses: ghosh.kanika7@gmail.com (K. Ghosh), kotake@mail.saitama-u.ac.jp (T. Kotake).

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RESEARCH ARTICLE

A Study of Conformal η-Einstein Solitons on Trans-Sasakian 3-Manifold

Yanlin Li[1] · Somnath Mondal[2] · Santu Dey[3] · Arindam Bhattacharyya[2] · Akram Ali[4]

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Abstract
We study conformal η-Einstein solitons on the framework of trans-Sasakian manifold in dimension three. Existence of conformal η-Einstein solitons on trans-Sasakian manifold is discussed. Then we find some results on trans-Sasakian manifold which are conformal η-Einstein solitons where the Ricci tensor is cyclic parallel and Codazzi type. We also consider some curvature conditions with addition to conformal η-Einstein solitons on trans-Sasakian manifold. We also use torse-forming vector fields in addition to conformal η-Einstein solitons on trans-Sasakian manifold. Finally, an example of conformal η-Einstein solitons on trans-Sasakian manifold is constructed.

Keywords Trans-Sasakian manifold · Einstein soliton · Conformal η-Einstein soliton · Codazzi type Ricci tensor · $\mathcal{C}$-Bochner curvature tensor · $\mathcal{W}_2$ curvature tensor · $\mathcal{M}$-projective curvature tensor

1 Introduction

The Ricci flow on a smooth manifold M with Riemannian metric $g(t)$ is given by

$$\frac{\partial}{\partial t}g(t) = -2Ric,$$

where Ric is the Ricci tensor of the metric $g(t)$. A Ricci soliton is a solution of Ricci flow (see details [24, 25, 57]), defined on a pseudo-Riemannian manifold (M, g) by

Yanlin Li, Somnath Mondal, Santu Dey, Arindam Bhattacharyya and Akram Ali have contributed equally to this work.

✉ Yanlin Li
liyl@hznu.edu.cn

Extended author information available on the last page of the article

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Review

Geometry of para-Sasakian metric as an almost conformal η-Ricci soliton

Sumanjit Sarkar [a,*], Santu Dey [b], Ali H. Alkhaldi [c], Arindam Bhattacharyya [a]

[a] Department of Mathematics, Jadavpur University, Kolkata-700032, India
[b] Department of Mathematics, Bidhan Chandra College, Asansol, Burdwan, West Bengal-713304, India
[c] Department of Mathematics, College of Science, King Khalid University, 9004 Abha, Saudi Arabia

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ABSTRACT

In this paper, we initiate the study of conformal η-Ricci soliton and almost conformal η-Ricci soliton within the framework of para-Sasakian manifold. We prove that if para-Sasakian metric admits conformal η-Ricci soliton, then the manifold is η-Einstein and either the soliton vector field V is Killing or it leaves ϕ invariant. Here, we show the characteristics of the soliton vector field V and scalar curvature when the manifold admits conformal η-Ricci soliton and vector field is pointwise collinear with the characteristic vector field ξ. Next, we show that a para-Sasakian metric endowed an almost conformal η-Ricci soliton is η-Einstein metric if the soliton vector field V is an infinitesimal contact transformation. We also display that the manifold is Einstein if it represents a gradient almost conformal η-Ricci soliton. We develop an example to display the existence of conformal η-Ricci soliton on 3-dimensional para-Sasakian manifold.

1. Introduction

In modern mathematics, the methods of paracontact geometry play an important role. The notion of almost paracontact manifold was first introduced by Sato [21]. After that he and Matsumoto [22] defined and studied a para-Sasakian manifold as special case of an almost paracontact manifold. Adati et al. [1] deduced some fundamental properties of para-Sasakian manifold. Later Kaneyuki and Williams [12] associated pseudo-Riemannian metric with an almost paracontact manifold after Takahashi [24] introduced pseudo-Riemannian metric in contact manifold, in particular, in Sasakian manifold. Zamkovoy in [27] proved that any almost paracontact structure admits a pseudo-Riemannian metric with signature $(n+1,n)$. Para-Sasakian manifold (in short p-Sasakian manifold) was studied by many authors, namely: Calvaruso [4], Cappelletti et al. [6], Tripathi et al. [25] and many others.

A pseudo-Riemannian manifold (M,g) admits a Ricci soliton which is a generalization of Einstein metric (i.e., $S=ag$ for some constant a) if there exists a smooth non-zero vector field V and a constant λ such that

* Corresponding author.
E-mail addresses: imsumanjit@gmail.com (S. Sarkar), santu.mathju@gmail.com (S. Dey), ahalkhaldi@kku.edu.sa (A.H. Alkhaldi), bhattachar1968@yahoo.co.in (A. Bhattacharyya).

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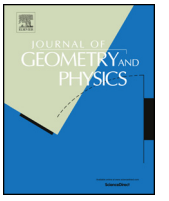

Certain results of κ-almost gradient Ricci-Bourguignon soliton on pseudo-Riemannian manifolds

Santu Dey

Department of Mathematics, Bidhan Chandra College, Asansol-4, West Bengal-713304, India

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Para-Sasakian manifolds
Para-cosymplectic manifolds

ABSTRACT

The prime object in this article is to study κ-almost Ricci-Bourguignon soliton and κ-almost gradient Ricci-Bourguignon soliton within the framework of paracontact metric manifolds. Here, we realize some conditions under which a paracontact metric manifold admitting a κ-Ricci–Bourguignon almost soliton is Einstein (trivial) and η-Einstein. We also show that if a three dimensional para-Kenmotsu manifold M^3 admitting a κ-almost gradient Ricci-Bourguignon soliton with a constant scalar curvature, then the soliton becomes an almost gradient Ricci-Bourguignon soliton whose soliton function is $-\Omega$. We also characterize and find some notable results κ-almost gradient Ricci-Bourguignon soliton on para-Sasakian manifolds and para-cosymplectic manifolds.

1. Introduction and motivations

In modern mathematics, paracontact geometry plays an important role. The notion of almost paracontact manifold was first introduced by Sato [59]. Later, Sato et al. [60] demonstrated a para-Sasakian manifold as a special case of an almost paracontact manifold. Adati et al. [1] extrapolated some fundamental properties of para-Sasakian manifold. Later Kaneyuki and Williams [30] associated pseudo-Riemannian metric with an almost paracontact manifold after Takahashi [64] introduced pseudo-Riemannian metric in contact manifold, in particular, in Sasakian manifold. Zamkovoy in [69] proved that any almost paracontact structure admits a pseudo-Riemannian metric with signature $(n+1,n)$. Para-Sasakian manifold (in short p-Sasakian manifold) was studied by many authors, namely: Calvaruso [7], Cappelletti et al. [11], Tripathi et al. [65] and many others.

In the current scenario, the theoretical physicists are interested in Ricci soliton because connected in String theory and the fact that soliton equation is a particular case of the Einstein field equation. A pseudo-Riemannian manifold (M,g) admits a Ricci soliton which is a generalization of Einstein metric (i.e., $\mathcal{S}=ag$ for some constant a) if there exists a smooth non-zero vector field V and a constant Ω such that

$$\frac{1}{2}\mathfrak{L}_V g+\mathcal{S}+\Omega g=0,$$

E-mail addresses: santu.mathju@gmail.com, santu@bccollegeasansol.ac.in.

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Article

General Relativistic Space-Time with η_1-Einstein Metrics

Yanlin Li [1], Fatemah Mofarreh [2], Santu Dey [3], Soumendu Roy [4] and Akram Ali [5,*]

[1] School of Mathematics, Hangzhou Normal University, Hangzhou 311121, China; liyl@hznu.edu.cn
[2] Mathematical Science Department, Faculty of Science, Princess Nourah bint Abdulrahman University, Riyadh 11546, Saudi Arabia; fyalmofarrah@pnu.edu.sa
[3] Department of Mathematics, Bidhan Chandra College, Asansol 713304, India; santu@bccollegeasansol.ac.in
[4] Department of Science & Humanities, MLR Institute of Technology, Hyderabad 500043, India; soumendu1103mtma@gmail.com
[5] Department of Mathematics, College of Science, King Khalid University, Abha 61421, Saudi Arabia
* Correspondence: akali@kku.edu.sa

Abstract: The present research paper consists of the study of an η_1-Einstein soliton in general relativistic space-time with a torse-forming potential vector field. Besides this, we try to evaluate the characterization of the metrics when the space-time with a semi-symmetric energy-momentum tensor admits an η_1-Einstein soliton, whose potential vector field is torse-forming. In adition, certain curvature conditions on the space-time that admit an η_1-Einstein soliton are explored and build up the importance of the Laplace equation on the space-time in terms of η_1-Einstein soliton. Lastly, we have given some physical accomplishment with the connection of dust fluid, dark fluid and radiation era in general relativistic space-time admitting an η_1-Einstein soliton.

Keywords: general relativistic space-time; torse-forming vector fields; η_1-Einstein soliton; Einstein's field equation; dust fluid; dark fluid; radiation era; Laplacian equation

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1. Background and Motivations

Throughout the article, we shall utilize the following acronyms: GRS—general relativistic space-time, TFVF—torse-forming vector field, and EMT—energy-momentum tensor. Ricci's soliton is well known among theoretical physicists because it is linked to string theory. It is well known that the theoretical physicists are interested in the Ricci soliton due to its association with string theory. In recent times, Ricci solitons are quite interesting in the field of differential geometry and geometric analysis as they characteristically present the Einstein metric. As a result, Ricci solitons in pseudo-Riemannian settings are extensively studied, and Hamilton introduced the concept of Ricci flow and extended it to address Thurston's geometric hypothesis. A Ricci soliton is a location in Hamilton's Ricci flow that is fixed (see details [1,2]) and an obvious extension of Einstein's metric is defined on a pseudo-Riemannian manifold (M, g) by

$$\frac{1}{2}\pounds_V g + Ric = \Lambda_1 g, \tag{1}$$

where $\pounds_V$ stands for the Lie-derivative in the way of $V \in \chi(M)$, Λ_1 is a constant and the Ricci tensor of g is presented by Ric. The Ricci soliton is classified as follows:

(i) If $\Lambda_1 < 0$, then the Ricci soliton is said to be shrinking.
(ii) for $\Lambda_1 > 0$, then it is said to be expanding.
(iii) If $\Lambda_1 = 0$, then it is implied to be steady.

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Conformal Ricci soliton and almost conformal Ricci soliton in paracontact geometry

Santu Dey

Department of Mathematics
Bidhan Chandra College, Asansol 713304
West Bengal, India
santu.mathju@gmail.com
santu@bccollegeasansol.ac.in

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In this paper, we study conformal Ricci soliton and almost conformal Ricci soliton within the framework of paracontact manifolds. Here, we have shown the characteristics of the soliton vector field and the nature of the manifold if para-Sasakian metric satisfies conformal Ricci soliton. We also demonstrate the feature of the soliton vector field V and scalar curvature when the para-Sasakian manifold admitting conformal Ricci soliton and vector field is pointwise collinear with the characteristic vector field ξ. Next, we prove that if a K-paracontact manifold confesses a gradient conformal Ricci soliton, then it is Einstein. Next, we show that a para-Sasakian metric reveals with an almost conformal Ricci soliton that is either Einstein or η-Einstein metric if the soliton vector field V is an infinitesimal contact transformation. Lastly, we decorate an example of conformal Ricci soliton on para-Sasakian manifold.

Keywords: Ricci flow; conformal Ricci soliton; almost conformal Ricci soliton; gradient conformal Ricci soliton; para-Sasakian manifold; K-paracontact manifold.

Mathematics Subject Classification 2020: 53C15, 53C21, 53C25, 53E20

1. Introduction

In 1976, the notion of an almost paracontact manifold was first demonstrated by Sato [47]. Later, Matsumoto *et al.* [48] investigated a para-Sasakian manifold as a special case of an almost paracontact manifold. Adati *et al.* [1] deduced some fundamental properties of para-Sasakian manifold. After that, Kaneyuki *et al.* [22] investigated the concept of an almost paracontact pseudo-Riemannian structure, as a natural odd dimensional complement to para-Hermitian structure. Many authors like Calvaruso [9], Cappelletti *et al.* [10], Tripathi *et al.* [53] and many others have deliberated para-Sasakian manifold.

The study of Ricci solitons on pseudo-Riemannian (Riemannian) manifold is an interesting topic in modern differential geometry because it covers Einstein metric

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Characterization of general relativistic spacetime equipped with different types of solitons

Santu Dey
Department of Mathematics, Bidhan Chandra College
Asansol — 4, West Bengal 713304, India
santu.mathju@gmail.com
santu@bccollegeasansol.ac.in

Meraj Ali Khan*
Department of Mathematics
University of Tabuk, K.S.A.
meraj79@gmail.com

Soumendu Roy
Department of Mathematics
Jadavpur University, Kolkata 700032, India
soumendu1103mtma@gmail.com

Peibiao Zhao
Department of Applied Mathematics
Nanjing University of Science and Technology
Nanjing 210094, P. R. China
pbzhao@njust.edu.cn

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The aim of this paper is to study certain types of metrics such as conformal η-Ricci soliton and Yamabe soliton in general relativistic spacetime. Here, we have shown the nature of the soliton when the spacetime with semisymmetric energy–momentum tensor admits conformal η-Ricci soliton, whose potential vector field is torse-forming. We have studied certain curvature conditions on the spacetime that admits conformal η-Ricci soliton. Also, we have enriched the importance of the Laplace equation on the spacetime admitting conformal η-Ricci soliton. Next, we have given some applications of physical

*Corresponding author.

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A study of conformal almost Ricci solitons on Kenmotsu manifolds

Sumanjit Sarkar*
Department of Mathematics, Jadavpur University
Kolkata, West Bengal 700032, India
imsumanjit@gmail.com

Santu Dey
Department of Mathematics, Bidhan Chandra College
Asansol, Burdwan, West Bengal 713304, India
santu.mathju@gmail.com

Arindam Bhattacharyya
Department of Mathematics, Jadavpur University
Kolkata, West Bengal 700032, India
bhattachar1968@yahoo.co.in

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The goal of this paper is to study conformal almost Ricci solitons within the framework of Kenmotsu manifolds. First, we demonstrate that if the potential vector field is Jacobi along the Reeb vector field, then the soliton reduces to a conformal Ricci soliton. If the manifold is η-Einstein Kenmotsu manifold, we show that either the manifold is of constant scalar curvature or the potential vector field is an infinitesimal contact transformation. In addition, if we consider the soliton vector field as a contact vector field, then either the gradient of λ is pointwise collinear with the Reeb vector field or the manifold becomes η-Einstein. Lastly, we develop an example of a conformal almost Ricci soliton on the Kenmotsu manifold.

Keywords: Ricci flow; conformal Ricci flow; conformal almost Ricci soliton; Kenmotsu manifold.

Mathematics Subject Classification 2020: 53C15, 53C21, 53C25, 53E20

1. Introduction

Contact geometry methods play an important role in modern mathematics, which has evolved from the mathematical formalism of classical mechanics. In 1969, Tanno [1] classified the connected almost contact metric manifolds. In [2], a new class of

*Corresponding author.

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Geometry of almost contact metrics as a $*$-conformal Ricci–Yamabe solitons and related results

Santu Dey

Department of Mathematics, Bidhan Chandra College
Asansol - 4, West Bengal 713304, India
santu.mathju@gmail.com

Soumendu Roy

Division of Mathematics, School of Advanced Sciences
Vellore Institute of Technology, Chennai 600127, India
soumendu1103mtma@gmail.com
soumendu.roy@vit.ac.in

Fatma Karaca*

İstanbul Beykent University, Department of Mathematics
İstanbul 34550, Türkiye
fatmakaraca@beykent.edu.tr

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The goal of this paper is to study certain types of metric such as $*$-conformal Ricci–Yamabe soliton (RYS), whose potential vector field is torse-forming on Kenmotsu manifold. Here, we establish the conditions for solitons to be expanding, shrinking or steady and find the scalar curvature when the manifold admits $*$-conformal RYS on Kenmotsu manifold. Next, we developed the nature of the vector field when the manifold satisfies $*$-conformal RYS. Also, we have adorned some applications of torse-forming vector field in terms of $*$-conformal RYS on Kenmotsu manifold. We have also studied infinitesimal CL-transformation and Schouten–van Kampen connection on Kenmotsu manifold, whose metric is $*$-conformal RYS. We present an example of $*$-conformal RYS on three-dimensional Kenmotsu manifold, and verify some of our findings.

Keywords: Ricci–Yamabe soliton; $*$-conformal Ricci–Yamabe soliton; torse-forming vector field; conformal Killing vector field; Kenmotsu manifold.

Mathematics Subject Classification 2020: 53C15, 53C25, 53C44

*Corresponding author.

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Applications of some types of solitons within the framework of Kählerian spacetime manifolds

Santu Dey*
Department of Mathematics, Bidhan Chandra College
Asansol-4, West Bengal 713304, India
santu.mathju@gmail.com

Siraj Uddin
Department of Mathematics, Faculty of Science
King Abdulaziz University, Jeddah 21589, Saudi Arabia
siraj.ch@gmail.com

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In this paper, we study applications of some certain types of solitons such as conformal Ricci soliton, conformal η-Ricci–Yamabe soliton and η-Ricci soliton on Kählerian spacetime manifolds. Further, we have developed the characteristics of conformal Ricci soliton and conformal η-Ricci–Yamabe soliton on almost pseudo-symmetric Kählerian spacetime manifolds. Here, we have signalized the nature of solitons in terms of shrinking, steady or expanding and we have also presented the relationship between λ and μ in terms of conformal η-Ricci–Yamabe soliton. Finally, we have embellished the classification of the potential function with respect to gradient η-Ricci soliton on Kählerian spacetime manifolds.

Keywords: Ricci flow; η-Ricci soliton; conformal Ricci soliton; conformal η-Ricci–Yamabe soliton; almost pseudo-symmetric manifolds; Kählerian spacetime manifolds.

Mathematics Subject Classification 2020: 53C15, 53C21, 53C25, 53D15

1. Background and Motivations

Ricci solitons have received a lot of attention by many geometers, mainly due to the intense works of Hamilton (and also Perelman). In the recent years, Ricci solitons are of much interest in the field of differential geometry and geometric analysis as it naturally extends Einstein metric. In 1982, Hamilton [20] introduced the concept of Ricci flow, which is an evolution equation for metrics on a Riemannian manifold.

*Corresponding author.

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Geometry of almost contact metrics as an almost $*$-η-Ricci–Bourguignon solitons

Santu Dey
Department of Mathematics, Bidhan Chandra College, Asansol-4, West Bengal 713304, India
santu.mathju@gmail.com
santu@bccollegeasansol.ac.in

Young Jin Suh
Department of Mathematics and RIRCM, Kyungpook National University, Daegu 41566, South Korea
yjsuh@knu.ac.kr

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In this paper, we give some characterizations by considering almost $*$-η-Ricci–Bourguignon soliton as a Kenmotsu metric. It is shown that if a Kenmotsu metric endows a $*$-η-Ricci–Bourguignon soliton, then the curvature tensor R with the soliton vector field V is given by the expression $(\mathcal{L}_V R)(V_1,\xi)\xi = 2\vartheta\{V_1(r)\xi - V_1(Dr) + \xi(Dr) - \xi(r)\xi - Dr\}$. Next, we show that if an almost Kenmotsu manifold such that ξ belongs to $(\kappa,-2)'$-nullity distribution where $\kappa < -1$ acknowledges a $*$-η-Ricci–Bourguignon soliton satisfying $\Omega + \psi \neq \vartheta[(r+4n^2) + \{\xi(\xi(r)) - \xi(Dr)\}]$, then the manifold is Ricci-flat and is locally isometric to $\mathbb{H}^{n+1}(-4) \times \mathbb{R}^n$. Moreover if the metric admits a gradient almost $*$-η-Ricci–Bourguignon soliton and ξ leaves the scalar curvature r invariant on a Kenmotsu manifold, then the manifold is an η-Einstein. Also, if a Kenmotsu metric represents an almost $*$-η-Ricci–Bourguignon soliton with potential vector field V is pointwise collinear with ξ, then the manifold is an η-Einstein.

Keywords: (κ,ψ)-almost Kenmotsu manifold; $(\kappa,\psi)'$-almost Kenmotsu manifold; $*$-η-Ricci–Bourguignon soliton.

Mathematics Subject Classification 2020: 53D15, 53C15, 53C25

1. Introduction and Motivations

The scientists and mathematicians across many disciplines have always been fascinated to study indefinite structures on manifolds. When a manifold is endowed with a geometric structure, we have more opportunities to explore its geometric properties. In 1981, a new geometric flow, named Ricci–Bourguignon flow, was introduced by Jean-Pierre Bourguignon [5], which was constructed and based on

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Characterization of Almost η-Ricci–Yamabe Soliton and Gradient Almost η-Ricci–Yamabe Soliton on Almost Kenmotsu Manifolds

Somnath MONDAL
Department of Mathematics, Jadavpur University, Kolkata-700032*, India*
E-mail: *somnathmondal.math@gmail.com*

Santu DEY[1)]
Department of Mathematics, Bidhan Chandra College
Asansol-4*, West Bengal*-713304*, India*
E-mail: *santu.mathju@gmail.com*

Arindam BHATTACHARYYA
Department of Mathematics, Jadavpur University, Kolkata-700032*, India*
Email: *bhattachar*1968*@yahoo.co.in*

Abstract The prime object in this article is to study an almost η-Ricci–Yamabe soliton and gradient almost η-Ricci–Yamabe soliton within the framework of almost Kenmotsu manifolds. It is shown that normal almost Kenmotsu manifold admitting an almost η-Ricci–Yamabe soliton or gradient η-Ricci–Yamabe soliton is locally isometric to hyperbolic space $\mathbb{H}^{2n+1}(-1)$. Next, we prove that if a (κ,μ) almost Kenmotsu manifold admits an almost η-Ricci–Yamabe soliton, then the manifold is η-Einstein. Besides, we find the condition for non-normal almost Kenmotsu manifolds acknowledging gradient almost η-Ricci–Yamabe soliton. Moreover, an almost η-Ricci–Yamabe soliton on $(\kappa,\mu)'$-almost Kenmotsu manifold has been studied. Lastly, we construct an example of a gradient almost η-Ricci–Yamabe soliton on a 3-dimensional Kenmotsu manifold.

Keywords Ricci soliton, (κ,μ)-almost Kenmotsu manifold, $(\kappa,\mu)'$-almost Kenmotsu manifold, η-Ricci–Yamabe soliton

MR(2010) Subject Classification 53D15, 53C15, 53C25

1 Introduction and Motivations

Contact geometry methods play an important role in modern mathematics. Contact geometry has evolved from the mathematical formalism of classical mechanics. In 1969, Tanno [46] classified the connected almost contact metric manifolds whose automorphism groups have maximal dimensions as follows:

(a) Homogeneous normal contact Riemannian manifolds with constant ϕ-holomorphic sectional curvature if $k(\xi,X)>0$;

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1) Corresponding author

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A study on conformal Ricci solitons and conformal Ricci almost solitons within the framework of almost contact geometry

Dey S.

The goal of this paper is to find some important Einstein manifolds using conformal Ricci solitons and conformal Ricci almost solitons. We prove that a Kenmotsu metric as a conformal Ricci soliton is Einstein if it is an η-Einstein or the potential vector field V is infinitesimal contact transformation or collinear with the Reeb vector field ξ. Next, we prove that a Kenmotsu metric as gradient conformal Ricci almost soliton is Einstein if the Reeb vector field leaves the scalar curvature invariant. Finally, we have embellished an example to illustrate the existence of conformal Ricci soliton and gradient almost conformal Ricci soliton on Kenmotsu manifold.

Key words and phrases: conformal Ricci soliton, Kenmotsu manifold, Einstein manifold, infinitesimal contact transformation.

Department of Mathematics, Bidhan Chandra College, Asansol, West Bengal, India
E-mail: santu.mathju@gmail.com

1 Introduction

In recent years, geometric flows, in particular, the Ricci flow have been an interesting research topic in differential geometry. The concept of Ricci flow was first introduced by R.S. Hamilton and developed to answer Thurston's geometric conjecture. A Ricci soliton can be considered as a fixed point of Hamilton's Ricci flow (see details in [17]) and a natural generalization of the Einstein metric (i.e., the Ricci tensor Ric is a constant multiple of the pseudo-Riemannian metric g), defined on a pseudo-Riemannian manifold (M, g) by

$$\frac{1}{2}\pounds_V g + Ric = \lambda g,$$

where $\pounds_V$ denotes the Lie-derivative in the direction of $V \in \chi(M)$, Ric is the Ricci tensor of g and λ is a constant. The Ricci soliton is said to be shrinking, steady, and expanding accordingly if λ is negative, zero, and positive respectively. Otherwise, it will be called indefinite. A Ricci soliton is trivial if V is either zero or Killing on M. First, S. Pigola et al. [22] assume the soliton constant λ to be a smooth function on M and named as Ricci almost soliton. After that, A. Barros et al. studied Ricci almost soliton detailed in [1,2]. Recently, J.T. Cho and M. Kimura [4] generalized the notion of Ricci soliton to η-Ricci soliton, C. Călin and M. Crasmareanu [5] studied this in Hopf hypersurfaces of complex space forms.

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Combined effects of temperature-dependent properties and magnetic field on electro-osmotic mobility at arbitrary zeta potentials

Amit Mondal[a], Prashanta Kumar Mandal[b], Subrata Maiti[c] and Gopal Chandra Shit[d]

[a]Department of Mathematics, Bidhan Chandra College, Asansol, India; [b]Department of Mathematics, Visva-Bharati, Santiniketan, Bolpur, India; [c]Department of BSH, University of Engineering & Management, Kolkata, India; [d]Department of Mathematics, Jadavpur University, Kolkata, India

ABSTRACT

We analyze the thermo-electroosmotic mobility of power-law electrolyte solution under the action of a magnetic field in a wavy pattern micro-channel. The flow is driven by the combined effect of the pressure gradient and the electric potential applied externally in the axial direction. The variable properties such as the viscosity, zeta potential, electrical and thermal conductivity of electro-thermal flow are assumed to vary with temperature. The entire flow phenomena have been solved by employing the finite difference method. We have presented the variation of electroosmotic mobility with the effect of Joule heating and applied magnetic field. We have examined the coupling effects of axial velocity, thermal energy, and electric potential function for various values of the temperature-dependent properties. These temperature-dependent property variations lead to developing volumetric flow rates associated with the behavior of the power-law index. The Nusselt number is drastically influenced by the temperature-dependent zeta potential variation in comparison with the Newtonian and shear-thickening fluids. The numerical and analytical solutions are validated with the existing literature and obtained a good agreement.

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Electro-osmotic flow; power-law fluid; temperature-dependent properties; electro-osmotic mobility; magnetic field

Nomenclature

a'	the amplitude of the wavy walls
B_0	magnetic field
Br	Brinkman number
C_p	specific heat
d'	constant height of the channel
E_0	a uniform electric field
E_{x^*}	applied electric field along x^* -direction
E_{y^*}	applied electric field along y^* -direction
e	charge of proton
Ha	Hartmann number

CONTACT A. Mondal amitmondal009@gmail.com

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Study of Bird Diversity during Monsoon Season Related to Air Quality Atasansol, West Bengal

Debdyuti Sengupta[1], Soumendra Nath Talapatra[2]

[1] Ph.D Scholar, Department of Environmental Science, Secom Skills University, Kendradangal, Birbhum, West Bengal, India

[2]Department of Bio-Science, Secom Skills University, Kendradangal, Birbhum, West Bengal, India

Corresponding author Email: *debdyutisenguptaindia[at]gmail.com*
Phone: +91-7550856044

Abstract: ***Qualitative and quantitative assessment of bird diversity as during monsoon season and correlated with available air quality parameters of Asansol, West Bengal. For bird diversity assessment, a total500-meter line transects was done randomly weekly twice a day (2hrs. duration in each day) and call count methods in industrial and urban area compared to suburban area for the period of three months (June 2021 – August 2021). Different biodiversity indices were compared between the sites. Overall air quality data were correlated with the value of bird diversity. In the present findings, qualitative and quantitative assessment indicated that the variety of bird species were observed less numbers (11 types and 118 organisms) in site A1 compared to site A2 (20 types and 202 organisms). Different indices such as Shannon diversity index, Index of Dominance, and Margalef's species richness index values were higher in site B (2.40, 0.87 and 3.60) when compared to site A (2.00, 0.81 and 2.10) while Berger-Parker Dominance Index value was observed lower in site A2 (0.30) when compared to site A1 (0.36). The values (Mean ± SD) of different air quality parameters (µg/m³) viz. $PM_{2.5}$, PM_{10}, SO_2 and NO_2 were 56.66±2.13, 114.32±5.64, 11.22±0.64 and 29.01±1.90, respectively. Different diversity indices were lower in the site A1 may be due to the combinations of air pollutants or PM_{10} itself when compared to site A2. In future, it is suggested to study avifaunal diversity in dry seasons viz. winter and summer related to the air quality status.***

Keywords: Bird diversity; Air quality; Industrial area; Urban area; Suburban area; Air quality bioindicator

1. Introduction

The study of bird diversity is very important because this indicates air quality of particular area. Several air pollutants viz. particulates and gaseous pollutants have an impact on bird species due to inhalation exposure.[1-2]A recent international study emphasized that decreasing of bird population in USA due to air pollutants especially ozone increasing rate.[3]Beside these, urbanization is also the causative reason for the declining of bird species.[4-5]Abnormal air quality due to industrial and automobile emissions that lead to air pollution. But present regulation of air pollution is based on human health hazards and no standards of pollutants have been proposed for avifauna or other chordates.

High diversity of avifauna indicates a healthy ecosystem and bird species fulfil several ecological functions in their habitats.[5-6] Moreover, insect feeder and raptors regulate disease vectors viz. mosquitoes and rodents. Scavenger birds, especially Pied Crow (*Corvus albus*) an important contributor for recycling of biomass and reducing disposable wastes.[5] Fruit eating birds help in seed dispersal of fleshy fruit.[7]Birds also participate in plant pollination.[8]

Several earlier studies have been reported bird diversity in different parts of West Bengal [9-13] but not related to air quality of urban and/or industrial area compared to suburban area. Chowdhury et al. [4]studied bird diversity related to traffic load near roadside parks without air quality assessment. Some international studies have been reported that air pollution causes the declining of the bird diversity [1-2,14]and it was observed a close relation between bird diversity in two parks of Kolkata and air pollution [15]but the correlation between air quality parameters and bird diversity in Asansol urbanized area near industry, West Bengal is lacking.

The present study was attempted the bird diversity as qualitative and quantitative assessment during monsoon season and corelated with available air quality parameters of Asansol, West Bengal.

2. Materials and Methods

Selection of study area

The study sites were selected as per heavily populated neighbourhoods, nearby residential buildings, nearby roads and continuous vehicular movements and nearby industries designated as site A1(latitude = 23° 40´ N and longitude = 86° 55´ E) and suburban area comparatively lower vehicular movements, far from industrial vicinity designated as site A2(latitude = 23° 67´ N and longitude = 87° 22´ E), Asansol, West Bengal. The study was carried out in these two habitats as per downwind direction for qualitative and quantitative assessment.

Study design

A total500-meter line transects was done randomly weekly twice a day (2hrs. duration in each day) and call count methods in industrial and urban area compared to suburban area for the period of three months (June 2021 – August 2021). The photographs of birds were taken during survey by using camera and was identified with the help of research articles.[16-18] Some unassuming bird species were identified based on their calls.[19]

Air quality data

All the secondary data of ambient air pollutants such as SO_2, NO_2, $PM_{2.5}$ and PM_{10} related to Asansol air quality monitoring station, West Bengal were retrieved from Air Quality Information System of West Bengal Pollution Control Board, Kolkata to know the present status of air quality during monsoon season (June 2021 – August 2021).

Qualitative and quantitative assessment of avifauna

Bird diversity indices such as total specimens (N), Shannon diversity index (H'), Index of Dominance (C), Berger-Parker

Dominance Index, and Margalef's species richness index (S) were calculated.[20-24] The formulae are as follows:

Shannon-Wiener diversity index (H') = - [$\sum$ Pi ln Pi] … (1)

where, Pi is proportion of species i relative to the total number of species, and lnPi is natural logarithm of this proportion.

Index of Dominance (C) = $\sum (ni/N)^2$…… (2)

where, ni = importance value for each species (number of individuals), N = total number of importance value

Berger-Parker Dominance Index= N_{max} / N …… (3)

where, N_{max} is the number of Individuals of a species, and N is total population of birds.

Margalef's species richness = S–1 ÷ ln N …… (4)

where, S = number of species, ln N = natural logarithm of the total number of individuals

The values of different biodiversity indices were calculated by using online tool namely Biodiversity calculator developed by AL Young Studio (https://www.alyoung.com/labs/biodiversity_calculator.html ?rand).

Statistical analysis

The Pearson correlation coefficient was analyzed to determine significant association between different air quality parameters and number of bird species during monsoon. All the data were considered the significance level at $P<0.05$ by using statistical software, PAST (PAleontological STatistics) software (version 3.26) developed by Hammer et al. [25]

3. Results

In the present findings, qualitative and quantitative assessment indicated that the variety of bird species were observed few in numbers in site A compared to site B (Table 1). The comparison revealed bird varieties of about 11 types in site A than varieties of about 20 types in site B. Common species of birds were *Corvus splendens*, *Columba livia*, *Acridotheres tristis*, *Acridotheres ginginianus*, *Spilopelia chinensis*, *Turdoides striata*, *Anas platyrhynchos domesticus*, *Copsychus saularis*, and *Dicrurus adsimilis*observed in both study sites. Moreover, few species were observed only in site B not in site A.

Table 1: List of avifauna in the study sites

Site A1				Site A2			
S. No.	Common Name	Scientific Name	Total No.	Sl. No.	Common Name	Scientific Name	Total No.
1.	House crow	*Corvus splendens*	15	1.	Indian pigeon	*Columba livia*	60
2.	Indian pigeon	*Columba livia*	42	2.	Spotted dove	*Spilopelia chinensis*	18
3.	Common mayna	*Acridotheres tristis*	12	3.	Jungle babbler	*Turdoides striata*	12
4.	Bank mayna	*Acridotheres ginginianus*	4	4.	Common mayna	*Acridotheres tristis*	8
5.	Spotted dove	*Spilopelia chinensis*	2	5.	Asian koel	*Eudynamys scolopaceus*	1
6.	Jungle babbler	*Turdoides striata*	8	6.	Vulture	*Gyps indicus*	2
7.	Indian little black cormorant	*Phalacrocorax* sp.	1	7.	House crow	*Corvus splendens*	25
8.	Domestic duck	*Anas platyrhynchos domesticus*	12	8.	White breasted water hen	*Amaurornis phoenicurus*	7
9.	Oriental magpie robin	*Copsychus saularis*	2	9.	Indian rose ringed parakeet	*Psittaciformes sp.*	12
10.	Cock	*Gallus gallus domesticus*	15	10.	Red vented bulbul	*Pycnonotus cafer*	2
11.	Bronzed drongo	*Dicrurus adsimilis*	5	11.	Red whiskered bulbul	*Pycnonotus jocosus*	1
				12.	Cattle egret	*Bubulcus ibis*	12
				13.	Bank mayna	*Acridotheres ginginianus*	5
				14.	Domestic duck	*Anas platyrhynchos domesticus*	11
				15.	Cock	*Gallus gallus domesticus*	9
				16.	Purple sunbird	*Cinnyris asiaticus*	4
				17.	Bronzed drongo	*Dicrurus adsimilis*	8
				18.	Oriental magpie robin	*Copsychus saularis*	2
				19.	Greater coucal	*Centropus sinensis*	1
				20.	Woodpecker	*Dinopium benghalense*	2

Table 2 evaluates the comparative diversity indices between the site A1 and A2. Higher value of the number of total organisms of about 202 in site A2 when compared to site A1 (118).Different indices such as Shannon diversity index, Index of Dominance, and Margalef's species richness index values were higher in site A2 (2.40, 0.87 and 3.60) when

compared to site A1 (2.00, 0.81 and 2.10) while Berger-Parker Dominance Index value was observed lower in site A2 (0.30) when compared to site A1 (0.36).

Table 2: Diversity indices compared between the site A1 and A2

Indices	Site A1	Site A2
Total No. of species	11	20
Total No. of organisms	118	202
Shannon-Wiener diversity index	2.00	2.40
Index of Dominance	0.81	0.87
Berger-Parker Dominance Index	0.36	0.30
Margalef's species richness	2.10	3.60

Fig 1 describes the values (Mean ± SD) of different air quality parameters in which all the parameters were observed within the national ambient air quality standards except PM_{10}. The value of $PM_{2.5}$, PM_{10}, SO_2 and NO_2 were 56.66 ±2.13 µg/m³, 114.32 ±5.64 µg/m³, 11.22 ±0.64 µg/m³ and 29.01 ±1.90 µg/m³, respectively.

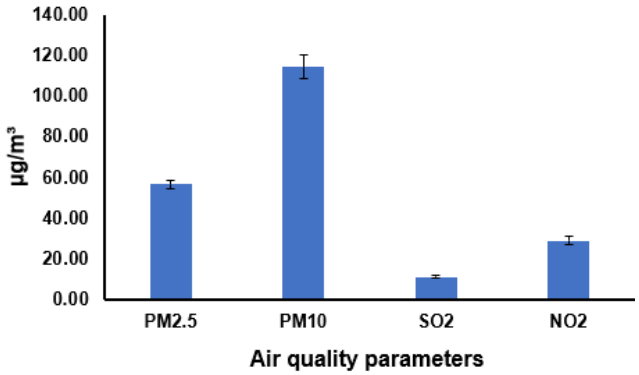

Figure 1: Average value of air quality parameters within the study area (Mean ± SD; n = 27)

Table 3estimates the Pearson correlation coefficient of air quality parameters and bird species availability in the site A1 and A2. In the site A, $PM_{2.5}$and PM_{10} were observed negative correlation (r = -0.024 and r = -0.399) while SO_2 and NO_2 shown positive correlation (r = 0.068 and r = 0.715) with the availability of bird species. In the site B, $PM_{2.5}$,SO_2 and NO_2 were observed negative correlation (r = -0.132, r = -0.234 and r = -0.105) while PM_{10}shown positive correlation (r = 0.103) with the availability of bird species.

Table 3: Correlation coefficient of air quality parameters and bird species availability in the site A1 and A2

Correlation coefficient of	Site A1	Site A2
$PM_{2.5}$ and bird species	r = -0.024	r = -0.132
PM_{10} and bird species	r = -0.399	r = 0.103
SO_2 and bird species	r = 0.068	r = -0.234
NO_2 and bird species	r = 0.715	r = -0.105

4. Discussion

The bird species are highly diverse and easily noticeable in the ecosystem. The diversity of avifauna declines due to environmental stresses especially abnormal air quality.[1-2,4,14-15]

In the present study sites common bird species such as *Corvus splendens*, *Columba livia*, *Acridotheres tristis*, *Acridotheres ginginianus*, *Spilopelia chinensis*, *Turdoides striata*, *Anas platyrhynchos domesticus*, *Copsychus saularis*, and *Dicrurus adsimilis*observed in both study sites. Moreover, few more species such as *Eudynamys scolopaceus*, *Gyps indicus*, *Amaurornis phoenicurus*, *Psittaciformes sp.*, *Pycnonotus cafer*, *Pycnonotus jocosus*, *Bubulcus ibis*, *Cinnyris asiaticus*, *Centropus sinensis*, and *Dinopium benghalense* were recorded only in site B but in site A, one specimen of *Phalacrocorax* sp. was recorded. In the recent study, the variation of bird species due to air pollution has been found in the parks of Kolkata metropolitan area.[15]

Different diversity indices were higher in the site A2due to less exposure of air pollutants compared to site A1 nearer to industrial vicinity and highly human interference as urbanized area. Moreover, all the air pollutants within the national ambient air quality standards except PM_{10}. These pollutants may be safe for human but unsafe for bird's growth, metabolic activity, respiratory rate, etc. for declining diversity in site A1. On the other hand, the diversity wasfound a decreasing trend may be due to elevated average level of PM_{10}, which has evidenced in the previous studies that particulates and other air pollutants decreased the diversity of avifauna.[2-3,14-15]

The negative value of the correlation coefficient, the r value indicates an increasing level of one parameter and decreasing in the other parameter. In the present study, there is a possibly of induction of air pollutants in site A1, which decreased the bird diversity as per decreased values of diversity indices, which is supported by earlier studies.[15,26] The relation between two variables could be established by correlation coefficient in which the parameters of air pollution and biodiversity of birds are interdependent and inversely related to each other.[15,27]

5. Conclusion

The present study was conducted in the monsoon season to know the bird diversity related to air quality parameters in the industrial vicinity and urbanized area (site A) compared to suburban area far away from industries(site B) at Asansol, West Bengal. Different diversity indices were lower in the site A may be due to the combinations of air pollutants or PM_{10} itself when compared to site A. In future, it is suggested to study avifaunal diversity in dry seasons viz. winter and summer related to the air quality status.

Conflict of interest
None

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Catalytic Enantioselective Synthesis of 4-Amino-5-aryltetrahydro-1*H*-benzo[*c*]azepines by an Aminoarylation Reaction

Sk Md Samim Akhtar[1]
Saumen Hajra*

Centre of Biomedical Research, Sanjay Gandhi Post-Graduate Institute of Medical Sciences Campus, Raebareli Road, Lucknow 226014, India
Saumen.hajra@cbmr.res.in
saumen.hajra@gmail.com

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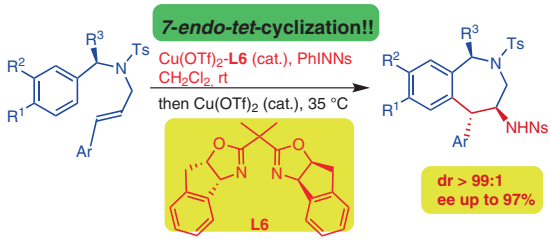

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Abstract A one-pot asymmetric aminoarylation reaction has been executed for the synthesis of *trans*-4-amino-5-aryltetrahydrobenzo[*c*]azepines with excellent diastereo- and enantioselectivity (dr > 99:1; ee ≤97%). The reaction progresses through aziridination of prochiral *N*-tosyl-*N*-cinnamylbenzylamines, followed by an intramolecular 7-*endo*-*tet* Friedel–Crafts cyclization of the tethered aziridines generated in situ, where the combination of $Cu(OTf)_2$ as a catalyst and PhINNs as a nitrene source was found to be effective. A chiral indenyl bis(oxazoline) was shown to be an efficient ligand for the catalytic enantioselective version of this one-pot transformation. This 7-*endo*-*tet* cyclization is contrary to the Baldwin cyclization rules.

Key words tetrahydrobenzazepines, asymmetric catalysis, aminoarylation, aziridines, Friedel–Crafts reaction, *endo*-*tet* cyclization

Nitrogen-containing heterocycles, such as azepines or their annulated variants, are ubiquitous structural motifs found in numerous natural and pharmaceutical products. However, tetrahydro-2-benzazepines remained an unprivileged class of heterocycles for a long period in medicinal and synthetic chemistry. Lately, this class of compounds has been found to elicit prominent biological activities, such as analgesic, antihypertensive, antitumor, and anti-Alzheimer's disease activities, among many others.[2–7] In particular, 4-amino-2-benzazepine[3–6] and 5-aryl-2-benzazepine motifs[7] are present in many compounds with profound bioactivities, such as compounds **A**–**F** (Figure 1). The dual ACE and NEP inhibitors AVE-7688 (Ilepatril) (**A**)[3] and MDL-100240 (**B**) are two advanced drug candidates for the potential treatment of hypertension and diabetic nephropathy.[4] The constrained dermorphin tetrapeptide analogue AN81 (**C**), a mixed μ-/δ-opioid agonist with subnanomolar binding affinity is a prospective analgesic. SBCHM01 (**D**) is a potent chimeric opioid agonist–neurokinin-1 antagonist for the treatment of chronic pain.[5] Several reports state that the 5-aryltetrahydro-2-benzazepines **E** are HIV integrase inhibitors, antiarrhythmics, analgesics, or reuptake inhibitors of dopamine and serotonin, and powerful agents for the treatment of mental disorders and hypoxia.[7] Furthermore, the indolobenzazepin-7-one **F**, containing a 4-amino-5-aryl-2-benzazepine nucleus, was recently identified as having cytotoxic and antitumor properties as an inhibitor of tubulin polymerization.[2d,e]

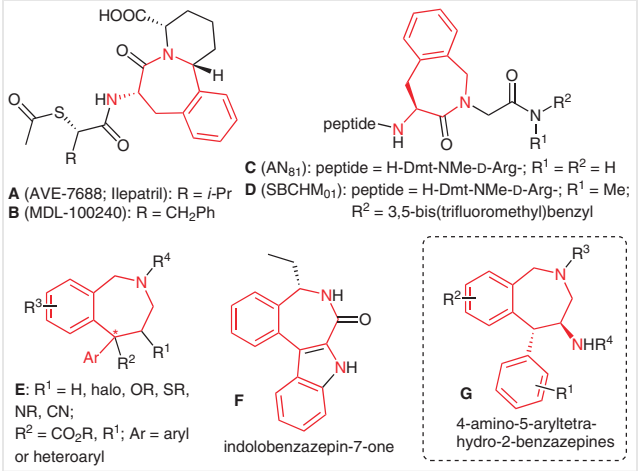

Figure 1 Representative 4-amino- and 5-aryltetrahydro-2-benzazepine-motif-containing bioactive molecules

The promising pharmacological potential and the challenge of constructing the benzo-annulated seven-membered ring of tetrahydro-2-benzazepine heterocycles have recently attracted the attention of the synthetic community.[8,9] However, a catalytic asymmetric synthesis of tetrahydro-2-benzazepines, in particular, those having a vicinal 4-amino, 5-aryl unit, is still an unmet challenge.

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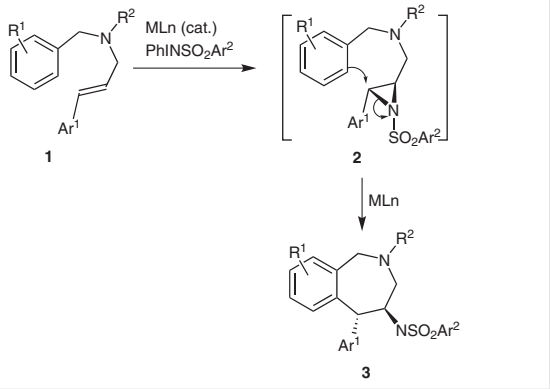
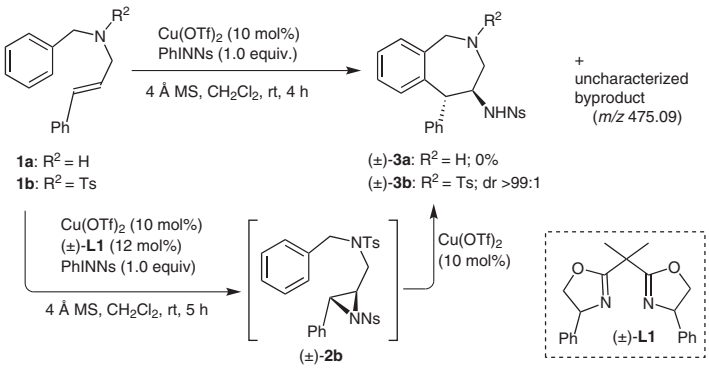
N-Benzyl-*N*-cinnamyl amines **1** were expected to generate the corresponding aziridines **2** by treatment with a suitable nitrene source. We envisioned a stereoselective intramolecular Friedel–Crafts cyclization of the in-situ-generated tethered aziridines **2** to give the tetrahydro-2-benzazepines **3** (Scheme 1), although such *7-endo-tet* cyclizations have been rarely reported in the literature[9f] Moreover, Baldwin's cyclization rules for the opening of three-membered rings to form cyclic structures seem to lie between those for tetrahedral and trigonal systems, with *exo*-modes being generally preferred'.[9a] We hoped that a suitable chiral catalyst would also induce enantioselectivity in this overall process. Here, we report a highly efficient catalytic and enantioselective one-pot synthesis of *trans*-4-amino-5-aryltetrahydro-2-benzazepines **3** with high diastereo- (>99:1) and enantioselectivities (up to 97% ee) through an aminoarylation reaction.



Scheme 1 Proposed *7-endo-tet*-aminoarylation reaction

Iminoiodinanes and Lewis acids are routinely paired for aziridination of alkenes, and have been used for decades.[10] The couple's application in stereoselective aziridination reactions has been recently studied in our laboratory.[11] We found that the nitrenoid reagent PhINNs (Ns = nosyl), in combination with $Cu(OTf)_2$, is an ideal precursor of a nitrene for delivery to an olefinic unit. Lewis acids such as $Cu(OTf)_2$, which can serve as dual-purpose catalysts, were expected to be effective in Friedel–Crafts reactions. At the outset, we employed the PhINNs–$Cu(OTf)_2$ couple in the reaction of *N*-cinnamylbenzylamine (**1a**) under well-established conditions. Amine **1a** (5.0 equiv) was treated with PhINNs (1.0 equiv) in the presence of 0.1 equivalent of $Cu(OTf)_2$ catalyst and molecular sieves (MS 4Å) in CH_2Cl_2 at room temperature (25 °C) (Scheme 2). However, this led to an intractable mixture, possibly as a result of the presence of the bare –NH group. It is reasonable to conclude that substrates with an exchangeable proton do not undergo the required reaction. Consequently, N-protection appeared to be inevitable to eliminate this issue. Accordingly, we planned to exploit the chemistry starting from *N*-tosyl-*N*-cinnamylbenzylamine (**1b**) under the aforementioned conditions at room temperature. Complete dissolution of the nitrenoid reagent required only four hours. Analysis of the reaction mixture after column chromatography revealed the formation of the expected 4-amino-5-phenyltetrahydro-2-benzazepine {(±)-**3b** (*m/z* 600.12 $[M + Na]^+$)} with >99:1 diastereoselectivity in 69% yield, along with a considerable amount of an uncharacterized byproduct (*m/z* = 475.09), but with no trace of the aziridine (±)-**2b**. A detailed spectral analysis also confirmed that the cyclized product was *trans*-4-amino-5-phenyltetrahydro-2-benzazepine [(±)-**3b**]. Introduction of the phenyl BOX ligand (±)-**L1** into the reaction afforded aziridine (±)-**2b** exclusively, but a further attempt at a one-pot cyclization of the in-situ-generated aziridine (±)-**2b** with a supplementary amount of $Cu(OTf)_2$ gave a similar result to that of the reaction without ligand (±)-**L1**. These observations suggested that the reaction needed to be optimized at the Friedel–Crafts cyclization step. Hence, aziridine (±)-**2b** was prepared by an aziridination reaction in the presence of ligand (±)-**L1** and isolated by column chromatography. A spectral analysis confirmed its structure to be that of the *trans*-aziridine (±)-**2b**. A number of metal catalysts were screened under various conditions [for details, see the Supporting Information (SI); Table S1]. Ultimately $Cu(OTf)_2$ at the slightly elevated temperature of 35

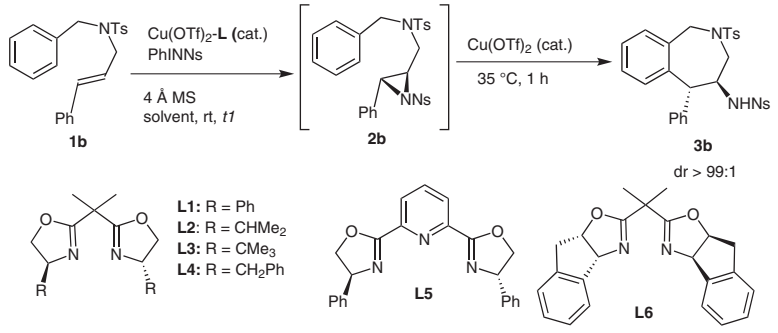


Scheme 2 One-pot aminoarylation reaction of **1** using $Cu(OTf)_2$ catalyst with and without a ligand

°C was found to suppress the formation of the noncharacterized byproduct and afforded an excellent yield (91%) of the desired tetrahydrobenzazepine (±)-**3b**.

Meanwhile, it was evident that a nonracemic synthesis of *trans*-4-amino-5-aryltetrahydro-2-benzazepines **3b** could be achieved by the introduction of chiral copper(II) catalyst into the reaction with subsequent tuning. Consequently, we chose to investigate several chiral bisoxazoline (Box) ligand-chelated copper catalysts for enantioinduction in the reaction (Table 1). The bisoxazoline ligand **L1** was included in an aziridination reaction that provided aziridine **2b** as the sole product after five hours. One-pot treatment of **2b** with a supplementary amount of $Cu(OTf)_2$ at 35 °C took one hour to give the desired product **3b** with 69% ee in 71% yield (Table 1, entry 1). With the sterically demanding *tert*-butylbisoxazoline **L3**, there was no improvement in the yield (69%), but the ee dropped significantly to 32% (entry 3). A similar yield and selectivity were obtained in aminoarylation in the presence of the isopropyl bisoxazoline ligand **L2** (entry 2). Unlike the phenyl bisoxazoline ligand **L1**, the benzyl bisoxazoline ligand **L4** showed poor selectivity (15%), even though it gave a better yield (entry 4). The PyBox ligand **L5**, derived from L-phenylglycine, gave a maximum yield of 89% but provided no selectivity (entry 5). The bisoxazoline ligand **L6**, derived from (1*R*, 2*S*)-1-aminoindan-2-ol gave an improved yield and the highest enantioselectivity, and it was recognized as being the most suitable ligand (entry 6). Notably, unlike the phenyl rings on the oxazoline units in in the phenyl Box ligand **L1**, those in the indenyl Box ligand **L6** are attached through an extra methylene bridge, which brings more rigidity to the structure. This structural strength of the indenyl Box ligand **L6** is responsible for providing the excellent enantioinduction. The absolute stereochemistry of the *trans*-cyclized product **3b** was assigned by analogy with reports in the literature.[10,11] After our search for an effective chiral catalyst, we screened several solvents. Halogenated solvents such as $CHCl_3$ and DCE gave decent selectivities in the series (entries 7 and 8), but CH_2Cl_2 remained the ideal choice, as it provided the highest yield of 81% and the highest enantioselectivity of 96%. CH_3CN also provided a moderate yield (77%), but a lower enantioselectivity (42%) (entry 9). The enantiomeric

Table 1 Optimization of the Reaction Conditions for the One-Pot Catalytic Asymmetric Aminoarylation Reaction[a]



	Ligand	Solvent	Time[b] (h)	Yield[c] (%) of **3b**	ee[d] (%) of **3b**
1	**L1**	CH_2Cl_2	5	71	69[e]
2	**L2**	CH_2Cl_2	5	58	29[e]
3	**L3**	CH_2Cl_2	5	69	32[e]
4	**L4**	CH_2Cl_2	5	80	15[e]
5	**L5**	CH_2Cl_2	7	89	0
6	**L6**	**CH_2Cl_2**	**5**	**81**	**96**
7	**L6**	$CHCl_3$	5	62	93
8	**L6**	DCE	5	59	88
9	**L6**	CH_3CN	3	77	42
10	**L6**	C_6H_6	5	50	64

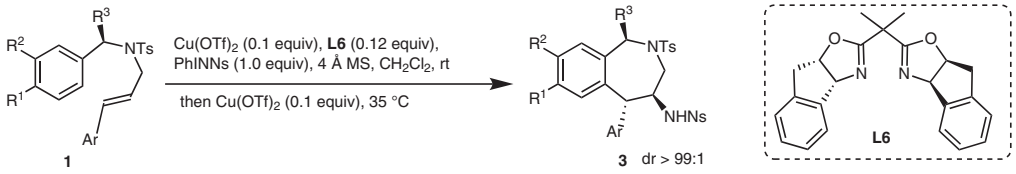
[a] Reaction conditions: Substrate **1b** (5 equiv), PhINNs (1.0 equiv), Box–Cu(II) complex [derived from $Cu(OTf)_2$ (10 mol%) and Box ligand **L** (12 mol%)], solvent, stirring at rt until complete dissolution of the nitrenoid reagent, then additional $Cu(OTf)_2$ (10 mol%), 35 °C, 1–2 h.
[b] Time for the aziridine formation.
[c] Isolated yield of **3b** after flash column chromatography.
[d] Determined by HPLC on a Chiralcel IA-3 column.
[e] The other enantiomer was formed predominantly.

leakage can be attributed to the high ligating affinity of the solvent molecules. The yield and selectivity did not improve in benzene (entry 10).

Earlier, it has been established that the enantioselectivity originates in the aziridination step and that the stereochemistry of the intermediate aziridine is relayed to the cyclized product.[11b–h] On this basis, we have previously accomplished asymmetric syntheses of dopamine D1 agonists (A-86929[11c] and dihydrexidine[11d]) and an antagonist (ecopipam[11e]), confirming the assigned absolute stereochemistry of both the newly generated stereocenters. Furthermore, Lewis acid-catalyzed intermolecular nucleophilic ring-opening reactions of chiral 2-arylaziridines mostly follow an S_N2-type mechanism with inversion of configuration at the benzylic center affording a high stereoselectivity of the product.[12] Intramolecular nucleophilic ring-opening reactions of chiral 1,2-disubstituted aziridines also follow a similar S_N2-type mechanism, providing excellent *trans*-diastereoselectivity (dr >99:1) irrespective of the ring size.[11] As in the earlier reports,[11] the other stereocenter of the aziridine in the present reaction remained undisturbed, affording an excellent diastereoselectivity of the cyclized product (dr > 99:1), so that the absolute configuration of the *trans*-cyclized product **3b** could be deduced by analogy.[10,11]

Having identified the optimal conditions for the catalytic enantioselective aziridination with the $Cu(OTf)_2$ catalyst and (1*R*, 2*S*)-1-aminoindan-2-ol-derived bis(oxazoline) ligand **L6** and the subsequent Friedel–Crafts cyclization of the in-situ-generated aziridine with additional $Cu(OTf)_2$, we continued to investigate the scope of this one-pot protocol for the asymmetric synthesis of the *trans*-tetrahydro-2-benzazepine derivatives **3** (Table 2).[13] Substrates **1c** and **1i**, having electron-deficient aromatic rings at either end, experienced a slightly slower reaction but gave moderate yields of the cyclized products **3c** and **3i** (71 and 72%), respectively, and an excellent 95% enantioselectivity in both cases (Table 2; entries 2 and 8). Substrates **1d**, **1f**, and **1g**, containing electron-rich aromatic rings at either end, underwent faster reactions and provided improved yields of **3d**, **3f**, and **3g**, with enantioselectivities of 96, 97, and 96% respectively (Table 2, entries 3, 5, and 6). The electron-rich substrates **1e** and **1h**, in which both aromatic rings carried electron-rich methoxy substituents, underwent similar smooth reactions to afford the corresponding products in excellent yields and high ee values (entries 4 and 7). Substrates **1f** and **1g**, with a piperonyl ring (entries 5 and 6), gave the corresponding cyclized products directly at rt in the shortest reaction time without any halt at the corresponding aziridine intermediate; the reaction of substrate **1f** registered the highest yield and enantioselectivity (entry 5). Because of the electron-deficient nature of substrate **1c**,

Table 2 Catalytic Asymmetric Aminoarylation for One-Pot Synthesis of *trans*-4-Amino-5-arylhexahydrobenzo[*c*]azepines **3**[a,12]



Entry	1	R^1, R^2	R^3	Ar	Time[b] (h)	Product	Yield[c] (%)	ee[d] (%)
1	**1b**	H, H	H	Ph	6	**3b**	81	96
2[e]	**1c**	F, H	H	4-FC_6H_4	10	**3c**	71	95
3	**1d**	H, OMe	H	4-MeC_6H_4	4	**3d**	84	96
4	**1e**	H, OMe	H	2-$MeOC_6H_4$	2	**3e**	83	87
5[f]	**1f**	OCH_2O	H	1-naphthyl	2	**3f**	87	97
6[f]	**1g**	OCH_2O	H	4-ClC_6H_4	2	**3g**	80	96
7	**1h**	OMe,H	H	3-$MeOC_6H_4$	4	**3h**	78	96
8	**1i**	OMe,H	H	4-FC_6H_4	7	**3i**	72	95
9	**1j**	H, H	Me	4-MeC_6H_4	6	**3j**	69	86

[a] Reaction conditions: **1** (5 equiv), PhINNs (1.0 equiv), Box-Cu(II) complex (derived from 10 mol% $Cu(OTf)_2$ and 12 mol% Box ligand **L6**), CH_2Cl_2, stirring at rt until complete dissolution of the nitrenoid reagent, then additional $Cu(OTf)_2$ (10 mol%), 35 °C, 1–2 h.
[b] Total time, including aziridine formation and subsequent cyclization.
[c] Isolated yield of **3** after flash column chromatography.
[d] Determined from HPLC on chiralpak IA 3 or IB 3 or IC 3 columns.
[e] Because of its electron-deficient nature, the corresponding aziridine did not cyclize in one pot. The reaction mixture was filtered through a short plug of silica gel and concentrated; the semicrude reaction mixture was then subjected to Friedel–Crafts cyclization with additional $Cu(OTf)_2$ in CH_2Cl_2.
[f] Compounds **1f** and **1g** gave the cyclized product **3f** and **3g** in one pot without the use of additional $Cu(OTf)_2$ at rt.

the corresponding aziridine **2c** did not cyclize in one pot. We therefore filtered the reaction solution through a short plug of silica gel and then processed the semicrude reaction mixture for Friedel–Crafts cyclization with additional $Cu(OTf)_2$. Due to the presence of a preinstalled chiral center, substrate **1j** was expected to be a challenging one; however, the optimized chiral induction efficiently furnished a single diastereomer (dr > 99:1) of the cyclized product **3j**. In terms of reactivity, substrate **1j** was comparable with **1b**, and therefore provided the desired product **3j** in good yield and selectivity (69% and 86%, respectively) (entry 9).

To support the seven-membered benzo[*c*]azepine structure **3** from the *7-endo-tet* Friedel–Crafts cyclization, 2D NMR spectroscopic experiments (COSY and HMBC) of compound **3g** were carried out. The COSY spectrum defines all the ^1H–^1H couplings assigned to the product. The HMBC spectrum contained three two-bond-coupling peaks [H(e)–5–11, H(e)–5–16, and H(e)–5–4] of the dibenzylic proton [H(e)] (Figure 2), thereby confirming the seven-membered structural feature of *trans*-4-amino-5-aryltetrahydro-2-benzazepines **3** (for details, see SI).

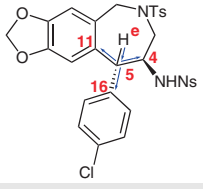


Figure 2 HMBC two-bond couplings of compound **3g**

In summary, we have developed a highly efficient, one-pot, asymmetric synthesis of 4-amino-5-aryltetrahydrobenzo[*c*]azepines with excellent diastereo- and enantioselectivity (dr > 99:1; ee ≤97%). Catalytic enantioselective aziridination of the cinnamyl unit of *N*-sulfonyl-*N*-cinnamylbenzylamines and subsequent regio- and stereoselective *7-endo-tet* Friedel–Crafts cyclization of tethered benzyl unit provides an excellent method. However, this *7-endo-tet*-cyclization is contrary to Baldwin's cyclization rules. The developed protocol might open up a new avenue in tetrahydrobenzo[*c*]azepine-based medicinal and drug-discovery chemistry.

Conflict of Interest

The authors declare no conflict of interest.

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Supporting Information

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(1) Present address: Department of Chemistry, Bidhan Chandra College, Asansol–713304, India

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(13) **4-Amino-5-aryltetrahydro-2-benzazepines 3b–j; General Procedure**

A two-necked, 25 mL, round-bottomed flask was charged with the Box ligand (1*R*,2*S*)-**L6** (0.011 g, 0.03 mmol, 0.12 equiv) and $Cu(OTf)_2$ (0.009 g, 0.025 mmol, 0.1 equiv). Anhyd CH_2Cl_2 (1.2 mL) was added by syringe, and the resulting mixture was stirred for 30 min at rt. To this solution were added substrate **1** (0.467 g, 1.23 mmol, 5.0 equiv) in CH_2Cl_2 (1.2 mL), PhINNs (0.1 g, 0.24 mmol, 1.0 equiv), and powered 4Å MS (0.2 g) and the mixture stirred at rt under argon. As soon as all the nitrenoid reagents were dissolved, additional $Cu(OTf)_2$ (0.007 g, 0.01 mmol, 0.1 equiv) was added to the reaction medium, which was then stirred at 35 °C under argon. The reaction, which was completed within 1 h, was quenched by dilution with EtOAc (10 mL). The mixture was then filtered through a short plug of silica gel that was washed with additional EtOAc (10 mL). The filtrate was concentrated by rotary evaporation under reduced pressure to give a crude mass that was purified by flash column chromatography (silica gel, EtOAc–hexane).

***N*-{(4*S*,5*R*)-5-Phenyl-2-tosyl-2,3,4,5-tetrahydro-1*H*-2-benzazepin-4-yl}-4-nitrobenzenesulfonamide (3b)**

White solid; yield: 91% (96% ee); mp 164–166 °C; $[\alpha]_D^{28}$ –137 (*c* 0.30, CH_2Cl_2). HPLC [Daicel Chiralpak IA-3, hexane–EtOAc (60:40), 1.0 mL/min, λ = 254 nm]: t_{major} = 6.1 min, t_{minor} = 7.2 min. ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.12 (d, *J* = 9.2 Hz, 2 H), 7.62 (d, *J* = 8.0 Hz, 2 H), 7.52 (d, *J* = 8.8 Hz, 2 H), 7.34 (d, *J* = 8.0 Hz, 2 H), 7.27–7.25 (m, 3 H), 7.19–7.17 (m, 3 H), 7.10 (d, *J* = 6.8 Hz, 4 H), 5.03 (d, *J* = 9.2 Hz, 1 H), 4.99–4.96 (m, 1 H), 4.34 (d, *J* = 9.2 Hz, 1 H), 3.86 (d, *J* = 10.8 Hz, 1 H), 3.24 (dd, *J* = 10.0, 2.0 Hz, 1 H), 3.18–3.14 (m, 1 H), 2.49 (s, 3 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 150.0, 144.6, 143.8, 140.5, 139.5, 132.9, 129.9, 128.9, 128.6, 128.5, 128.4, 128.3, 128.2, 127.7, 127.4, 127.1, 124.2, 62.9, 62.2, 53.8, 49.4, 21.6. DEPT-135 NMR (100 MHz, $CDCl_3$): δ = 130.4, 129.4, 129.2, 129.1, 129.0, 128.7, 128.6, 128.1, 127.9, 127.5, 124.6, 63.3, 62.7, 54.2, 49.9, 22.0. ESI-MS: *m/z* $[M + Na]^+$ calcd for $C_{29}H_{27}N_3NaO_6S_2$: 600.1239; found: 600.1238.

micromachines

Article

Development and Analysis of Graphene-Sheet-Based GaAs Schottky Solar Cell for Enriched Efficiency

L. Kholee Phimu [1], Rudra Sankar Dhar [1,*], Khomdram Jolson Singh [2] and Amit Banerjee [3,*]

[1] Department of Electronics and Communication Engineering, National Institute of Technology Mizoram, Aizawl 796012, India
[2] Department of Electronics and Communication Engineering, Manipur Institute of Technology, Canchipur, Imphal 795003, India
[3] Microsystem Design-Integration Lab, Physics Department, Bidhan Chandra College, Asansol 713303, India
* Correspondence: rudra.ece@nitmz.ac.in (R.S.D.); amitbanerjee.nus@gmail.com (A.B.)

Abstract: Comparative studies of the 2D numerical modelling and simulation of graphene-based gallium arsenide and silicon Schottky junction solar cell are studied using TCAD tools. The performance of photovoltaic cells was examined while taking parameters, such as substrate thickness, relationship between transmittance and work function of graphene, and n-type doing concentration of substrate semiconduction. The area with the highest efficiency for photogenerated carriers was found to be located near the interface region under light illumination. The significant enhancement of power conversion efficiency was shown in the cell with a thicker carrier absorption Si substrate layer, larger graphene work function, and average doping in a silicon substrate. Thus, for improved cell structure, the maximum J_{SC} = 4.7 mA/cm^2, V_{OC} = 0.19 V, and fill factor = 59.73% are found under AM1.5G, exhibiting maximum efficiency of 6.5% (1 sun). The EQE of the cell is well above 60%. This work reports the influence of different substrate thickness, work function, and N-type doping on the efficiency and characteristics of graphene-based Schottky solar cells.

Keywords: external quantum efficiency; graphene; power conversion efficiency; Schottky barrier solar cell (SBSC); TCAD

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1. Introduction

Due to graphene's unique structure and characteristics, a single atomic layer has attracted significant attention, such as high mobility, low resistivity, and band gap [1]. Graphene has been created as ultrathin sheets made of a few atomic layers through mechanical exfoliation or CVD (chemical vapour deposition) and can be shifted to many substrates; thus, it will open up a large range of potential applications, including smart composites, photo sensors, and high-performance electronic devices [2]. Specifically, the graphene layer is a major material for use in the production of effective solar cells due to its exceptional combination of optical transparency and high electrical conductivity in the visible and near-infrared spectrum [3,4]. On various substrates, such as Si [5], CdS [6], CdSe [7], and GaAs [8], graphene-based Schottky junction solar cells have been produced in recent years. A Schottky junction was successfully formed on n-type GaAs by Wenjing et al., producing a power conversion efficiency of 1.95% [9]. GaAs has more radiation resistance [10] than the Si substrate, which is most frequently used, and has a direct band gap [11], which makes it suitable for highly efficient solar cells for both terrestrial and space applications. However, in order to increase solar cell efficiency, the band parameter must be studied, and various thicknesses of the structure must be optimised. We, therefore, optimised the thickness of the GaAs substrate with a graphene layer in SILVACO TCAD in this paper, and the results were confirmed using published experimental data.

The proposed graphene structure is shown in Figure 1. It consists of three regions. The ability to create graphene-on-silicon Schottky solar cells at room temperature opens up a wide

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A Study on the Mechanical Properties of Rare Earth-based Aluminium Composite

K. Balamurugan, T. Deepthi, Ananda Kumar Subramanian, Amit Banerjee, Daksh Agarwal, Arindam Biswas & Arijit Sinha

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Abstract

The present investigation signifies the effect of incorporation of lanthanum phosphate nanopowder at different weight ratios in aluminium matrix. The lanthanum phosphate reinforcements in the 50–80 nm size range are synthesized through a cost-effective sol–gel process, without any subsequent secondary process. The composite is fabricated by the ultrasonic-assisted stir casting process, a low cost and a less defective manufacturing process. Various mechanical properties, viz. ultimate tensile strength, flexural strength, compressive strength and hardness, are examined. From the study, it is concluded that MMC with 15 wt% the lanthanum phosphate leads to the best tensile, compression and flexural properties as well as hardness. Blending the reinforcement in the matrix is a challenging task, besides the selection of suitable stirring conditions which greatly reduces the agglomerations. The higher bonding force between the reinforcement and the matrix makes the reinforcement a suitable material in the aluminium matrix composite, and it is confirmed through density functional theory studies. The superior properties of the Al/$LaPO_4$ composite make it a suitable replacement material for aerospace and defence applications.

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Research Article

Diagnose Diabetic Mellitus Illness Based on IoT Smart Architecture

Abhilash Pati,[1] Manoranjan Parhi,[1] Binod Kumar Pattanayak,[1] Debabrata Singh,[1] Debabrata Samanta,[2] Amit Banerjee,[3,4] Sajal Biring,[4,5] and Goutam Kumar Dalapati[4,6]

[1]*Siksha 'O' Anusandhan University, Bhubaneswar, Odisha, India*
[2]*Department of Computer Science, CHRIST University, Bangalore, India*
[3]*Physics Department, Bidhan Chandra College, Asansol 713 303, India*
[4]*Organic Electronics Research Center, Ming Chi University of Technology, New Taipei City, Taiwan 24301*
[5]*Department of Electronic Engineering, Ming Chi University of Technology, New Taipei City, Taiwan 24301*
[6]*Sunkonnect, 1 Cleantech Loop, Singapore 637141*

Correspondence should be addressed to Debabrata Samanta; debabrata.samanta369@gmail.com, Amit Banerjee; amitbanerjee.nus@gmail.com, and Sajal Biring; biring@mail.mcut.edu.tw

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Obtaining a quick remote diagnosis of heart disease has proven problematic in recent days. To overcome such issues in e-Healthcare systems, Internet of Things (IoT) applications have been deployed using cloud computing (CC) approaches. There are still a number of disadvantages to using CC, including latency, bandwidth, energy usage, and security and privacy concerns. Fog computing (FC), a CC development, may be able to overcome these obstacles. DiaFog enabling remote users for real-time diagnosis of diabetic mellitus disease (DMD) has been proposed in this study, which is based on the combined ideas of IoT, cloud, and fog computing, as well as an ensemble deep learning (EDL) technique. The proposed system is trained with EDL approaches on the integrated dataset of two diabetes mellitus disease datasets (DMDDs), namely, Pima Indians Diabetes Dataset (PIDD) and Hospital Frankfurt Germany Diabetes Dataset (HFGDD), obtained from the UCI-ML and Kaggle repository, respectively, and the integrated dataset of these two. The suggested system has been used to demonstrate accuracy, precision, recall, *F*-measure, latency, arbitration time, jitter, processing time, throughput, energy consumption, bandwidth utilization, network utilization, scalability, and more. In the remote instantaneous diagnosis of diabetic patients, the integration of IoT-fog-cloud is useful. The results of the trials show the value of employing FC principles and their applicability for speedy diabetic patient remote diagnosis. PACS-key is describing text of that key PACS-key describing text of that key.

1. Introduction

The first digital revolution, i.e., the connection of numerous networks known as the Internet, is regarded as an all-time brilliant invention. The evolving phase continues, and we are now in the second digital revolution, the Internet of Things (IoT), which is essential to long-distance communications. The Internet of Medical Things (IoMT) is a cutting-edge network that offers a global healthcare system that can cure any condition of any location [1, 2]. The globe is becoming more industrialized, and the deceased rate is rising. However, the number of lifestyle illnesses has been increased in the same period. Type 2 diabetes, heart attack, hypertension attack, and obesity are among these disorders. The kind of nutrition, degree of stress, lack of physical activity, and environmental variables are all critical contributing factors to various disorders. In some instances, the side effects of these disorders may result in life-threatening symptoms such as paralysis, shortness of breath, irregular heartbeat, cardiac arrest, and chest discomfort, all of which need immediate medical treatment. Wearables sensors and IoT applications are becoming more popular for inexpensive

ڈاکٹر جمشید احمد

صدر شعبۂ اردو، بی۔سی، کالج، آسنسول، (مغربی بنگال)

جمیل مظہری کی نظم نگاری: ایک محاکمہ

جمیل مظہری کا نام اردو نظم گو شعراء میں بڑی اہمیت کا حامل ہے۔ علامہ اقبالؔ کے بعد نظم نگاری کے اُفق پر جو شعراء نمودار ہوئے ان میں جمیل مظہری اپنی فکری وفنّی بالیدگی کے باعث ممتاز ومنفرد ہیں۔ ہر چند کہ جمیل مظہری علامہ اقبالؔ سے حد درجہ متاثر نظر آتے ہیں، انہیں اپنا مرشد فن بھی کہتے ہیں لیکن وہ ان کی کورانہ تقلید نہیں کرتے بلکہ ہر جگہ اپنی انفرادیت کو برقرار رکھتے ہیں۔ جمیل مظہری کی نظموں کا پہلا مجموعہ ''نقش جمیل'' ہے جو کہ ۱۹۵۸ء میں شائع ہوا۔ اس میں ''تفکرات وتاثرات''، ''سیاسیات وعمرانیات''، ''رومانیات اور شبابیات''، ''متفرقات اور باقیات'' کے عنوان کے تحت نظموں کی ابواب بندی کی گئی ہے۔ ان ابواب کے عنوانات سے ہی جمیل مظہری کی نظموں کے موضوعات کی رنگارنگی کا بخوبی اندازہ ہوجاتا ہے۔ ان کی نظموں کا دوسرا مجموعہ عکس جمیل ہے جو کہ جمیل مظہری کی وفات کے بعد شائع ہوا۔ اس میں ۱۹۵۸ء سے لیکر انکی وفات ۲۳ جولائی ۱۹۸۰ سے دو مہینے قبل تک کی نظمیں شامل ہیں۔ اس مجموعہ کو بھی مختلف ابواب میں تقسیم کیا گیا ہے مثلاً فکری، سیاسی وسماجی، رومانی، تہنیتی، تعزیتی اور متفرقات وغیرہ۔ اس کے آخر میں ہجویات وطنزیات کو بھی شامل کیا گیا ہے۔

جمیل مظہری بنیادی طور پر فکر وفلسفے کے شاعر ہیں۔ ان کی شخصیت کا بھرپور اظہار بھی انہیں نظموں میں ہوتا ہے۔ ان کے اندر ایک بے چین روح ہے جو ان میں اضطرابی کیفیت پیدا کرتی ہے۔ ان کے نزدیک زندگی جمود کا نام نہیں ہے بلکہ حرکت وعمل کا نام ہے۔ انہوں نے حرکت وعمل کے اس فلسفے کو اپنی نظم ''پیام'' میں بڑی خوبصورتی سے پیش کیا ہے۔

اس نظم کے دو بند بطور مثال ملاحظہ ہوں:

جز سعیٔ دوام اور کیا ہے؟ شاعر کا پیام اور کیا ہے؟
یعنی اس میکدے کی رونق جز گردش جام اور کیا ہے؟
انسان کا کام اور کیا ہے؟

کوشش میں ہے راز نظم ہستی جنبش ہے دلیل زندگانی

رفیعہ شبنم عابدی کی نظموں میں نسائی حسّیت

ڈاکٹر جمشید احمد

نسائی حسیت کے تعلق سے رفیعہ شبنم عابدی کی نظمیں بڑی اہمیت رکھتی ہیں۔انھوں نے اپنے تخلیقی سفر کا آغاز افسانہ نگاری سے کیا اور اسکے بعد شاعری کی طرف مائل ہوئیں۔موسم بھیگی آنکھوں کا، اگلی رت کے آنے تک، آنگن آنگن پروائی اور نئی گھٹائیں اتر رہی ہیں انکے شعری مجموعے ہیں۔افسانہ اور شاعری کے علاوہ انھوں نے تنقید، تحقیق وتراجم کے میدان میں بھی گراں قدر خدمات انجام دیں۔میرے اس مقالے میں ان کی نظموں میں نسائی حسیت کا جائزہ لینے کی کوشش کی گئی ہے۔

جب ہم نسائی حسیت کی بات کرتے ہیں تو اس کے تعلق سے بہت سے فکری و ذہنی رویے سامنے آتے ہیں۔اور بہت سے نظریاتی مباحث کے بھی در وا ہوتے ہیں۔رفیعہ شبنم عابدی ان مباحث میں الجھے بغیر بطور عورت، عورتوں کی حق تلفی اور عورت مخالف معاشرے کے جبر کے خلاف اپنے جذبات و احساسات کا آزادانہ اور فن کارانہ اظہار کرتی ہیں۔اپنی شاعری کے متعلق انکی یہ رائے قابل غور ہے۔

''شاعری میرے لیے ایک اکائی کی حیثیت رکھتی ہے۔میں اسے کسی قسم کے water tight compartment میں بانٹنے کی قائل نہیں ہوں۔شائد اسی لیے شاعری کی کسی مخصوص ذہنی رویے یا فکری دبستان سے میری کوئی وابستگی نہیں۔میں ترقی پسند ہوں اس لیے کہ ترقی کو پسند کرتی ہوں۔جدیدیت سے میرا تعلق ہے اس لیے کہ جدت فکر کو اہمیت دیتی ہوں۔روایت پرست ہوں اس لیے کہ روایت سے انحراف میرا شیوہ نہیں۔میں صرف اتنا جانتی ہوں کہ میں ایک عورت ہوں۔ایک مشرقی ہندوستانی عورت۔جس سماج میں جس معاشرے میں اور جس گھر میں زندگی گزار رہی ہوں اسی معاشرے اسی سماج اور اسی گھر کی تصویریں میری شاعری میں ملتی ہیں۔اور یہی میرے لیے سبز رتوں کی بشارتیں۔''

(محاسبہ، اگلی رت کے آنے تک، ص ۶)

وہ اپنے تیسرے مجموعہ کلام نئی گھٹائیں اتر رہی ہیں میں لکھتی ہیں۔ ''یہ نسائی اور تانیثی اصطلاحیں اور تحریکیں میرے نزدیک کچھ اہمیت نہیں رکھتیں۔میری نگاہ میں یہ ایک فریب محض ہے۔میں نہیں جانتی کہ اپنی حق تلفی کا شکوہ یا عورت مخالف معاشرے کے جبر کا گلہ تانیثیت ہے یا محض نسائی جذبات کا انفرادی اظہار۔''

(وقت آگیا ہے، نئی گھٹائیں اتر رہی ہیں، ص ۱۰)

اپنی شاعری کے متعلق ان کے مذکورہ خیالات اس بات پر دال ہیں کہ انھوں نے تانیثی یا نسائی ادب کی اصطلاحات کے مکڑ جال میں الجھے بغیر اپنی شاعری کو نسائی جذبات و احساسات کے اظہار کا وسیلہ بنایا ہے۔اور معاشرے میں عورتوں کے خلاف ہونے والے ہر قسم کے مظالم اور صنفی امتیازات پر کھل کر لکھا ہے۔

معاشرے میں عورتوں کے ساتھ ہونے والے صنفی امتیازات اور سماجی استبداد کی مختلف جہتیں ہیں۔رفیعہ شبنم عابدی کی نظمیں ایک ایسا آئینہ خانہ ہے جہاں یہ تمام جہتیں منعکس ہو جاتی ہیں۔اور ہم اس آئینہ خانہ کی سیر کر کے جہاں ایک طرف عورتوں کے مسائل اور عصری حقائق سے واقفیت حاصل کرتے ہیں وہیں دوسری جانب عورت کے تئیں معاشرے کے خیالات و افکارات سے بھی آگہی حاصل ہوتی ہے۔گویا کہ انکی نظموں میں ایک پوری تہذیب منعکس ہو جاتی ہے۔ہم یہاں انکی نظم 'زاری' کا ذکر کرنا چاہتے ہیں۔یہ نظم سانحہ سورت پہ لکھی گئی ہے۔اس نظم میں یہ بتایا گیا ہے کہ جہاں زبانی جمع خرچ کا معاملہ ہو وہاں مرد عورت کو بڑی عزت و منزلت عطا کرتا ہے، اس کے لیے بہت سے حسین القاب و الفاظ کا استعمال کرتا ہے مگر اس کے برعکس جب عورت کو حقوق دینے کی بات آتی ہے، اس کی آزادی، شناخت اور تحفظ کی بات آتی ہے تو اسے بے قدر جان کر طرح طرح کے ظلم کا شکار بناتا ہے۔فسادات وغیرہ میں عورتوں کے ساتھ ہونے والے مظالم اور بربریت کی جو خبریں سامنے آتی ہیں وہ انسانیت کو شرمسار کرنے والی ہوتی ہیں۔اس تناظر میں انکی نظم 'زاری' کا یہ حصہ ملاحظہ فرمائیں۔

میں کہ ایک عورت ہوں
زندگی کی عظمت ہوں
مجھ سے نسل آدم ہے
اعتبار عالم ہے
میں گلاب کی خوشبو
میں شباب کا جادو
میں ہوا بھی بادل بھی
میں گھٹا بھی چھاگل بھی

Dr.John Gilchrist aur Fort William College by Dr.Jamshed Ahmad

(HOD Urdu B.C.College Asansol)cell-9593664494

ڈاکٹر جمشید احمد (صدر، شعبہ اردو، بی۔سی۔کالج، آسنسول)

ڈاکٹر جان گلکرسٹ اور فورٹ ولیم کالج

ڈاکٹر جان بورتھوک گلکرسٹ (John Borthwickgilchrist) کا نام فورٹ ولیم کالج سے وابستہ شخصیات میں بڑی اہمیت کا حامل ہے۔ ابتدا میں گلکرسٹ کو ادب سے کوئی خاص دلچسپی نہیں تھی۔ وہ ہندوستان ایسٹ انڈیا کمپنی میں اسسٹنٹ سرجن کی حیثیت سے آئے تھے۔ اور یہیں پر اپنی ذاتی کوشش سے اردو سیکھنے کی کوشش کی۔ اسکی وجہ یہ تھی کی گلکرسٹ کو ہندوستان آنے کے فوراً بعد ہی یہ بخوبی اندازا ہو گیا تھا کہ یہاں کی مقامی زبان سیکھے بغیر نہ تو یہاں کی زندگی سے لطف اندوز ہوا جا سکتا ہے اور نہ ہی یہاں کی طرز معاشرت سے۔ اور نہ ہی عوام کی زبان سیکھے بغیر عوام کے نزدیک آیا جا سکتا ہے۔ اس بات کی وضاحت خود گلکرست نے لغت وقواعد کے ضمیمہ میں ان الفاظ میں کی ہے۔

''۱۷۸۲ء میں بمبئی میں وارد ہوتے ہی میں نے محسوس کر لیا تھا کہ یہاں پر میرا قیام خواہ وہ کسی نوعیت کا ہو، میرے لیے ناخوشگوار اور میرے مالک (ملازمت دینے والا) کے لیے غیر سودمند ثابت ہوگا جب تک کہ مجھے اس ملک کی موجودہ زبان سے پوری طرح واقفیت نہ ہو، جہاں مجھے کچھ دنوں تک قیام کرنا ہے۔'' (بحوالہ فورٹ ولیم کالج کی ادبی خدمات، ڈاکٹر عبیدہ بیگم، صفحہ ۷۹)

لہٰذا اس احساس نے گلکرسٹ کو اردو زبان سیکھنے کی طرف مائل کیا۔ اور تین سال کی مدت میں انھوں نے اس زبان میں خاصی استعداد حاصل کر لی۔ اس زبان کو سیکھنے کی غرض سے انھوں نے طویل چھٹی بھی لی۔ لہٰذا ۱۷۸۵ء میں فیض آباد پہنچے اور ہندوستانی معاشرت اختیار کر کے اردو زبان کی تحقیق اور تحصیل میں مشغول ہو گئے۔ اس سلسلے میں انھوں نے دہلی بنارس اور لکھنو کا بھی سفر کیا۔ مختلف پنڈتوں اور منشیوں سے بھی فیض حاصل کیا۔ اس کا نتیجہ یہ ہوا کہ ان کو مشرقی زبانوں سے عموماً اور اردو سے خصوصاً گہرا لگاؤ پیدا ہو گیا۔ طالب علمی کے دوران گلکرسٹ کو انگریزوں کو ہندوستانی سکھانے والے مواد کے فقدان کا بھی گہرا تجربہ ہوا۔ لہٰذا انھوں نے اردو زبان کی قواعد اور لغت مرتب کرنے کا عہد کیا۔ اور دن رات کی مسلسل جدوجہد کے بعد ۱۷۸۷ء میں اس کا مسودہ مکمل کر لیا۔ اس کے تقریباً دو سال بعد جان گلکرسٹ کی دوسری کتاب 'ہندوستانی زبان کے قواعد' منظر عام پہ آئی۔ اور اس کے بعد

দক্ষিণ চব্বিশ পরগনার লুপ্ত-বিলুপ্তপ্রায় নদীকথা

দীপঙ্কর নস্কর

সুপ্রাচীন কাল থেকে নদী সভ্যতার ধারক ও বাহক। প্রাগৈতিহাসিক যুগ থেকে নদীকে কেন্দ্র করেই সভ্যতার সৃষ্টি ও বিকাশ ঘটেছে। বহু বছর ধরে প্রবহমান গঙ্গা-ব্রহ্মপুত্রের বাহিত পলিরাশির জমাট বাঁধা অংশ থেকে মধ্যবর্তী বৃহৎ ব-দ্বীপের সৃষ্টির মধ্য দিয়ে নিম্নগাঙ্গেয় অঞ্চলের জন্ম। আর এই ভূমিভাগেই সৃষ্টি সুপ্রাচীনকাল থেকে মনুষ্য বসতি এবং প্রকৃতির আপন খেয়ালে সৃষ্টি বহু নদ-নদী, গাঙ, খাল ও খাড়িযুক্ত অরণ্য সম্পদে সমৃদ্ধ জনপদ। একদা নদ-নদী নিম্নগাঙ্গেয় অঞ্চলের রাজপথ ছিল। আলোচ্য অঞ্চলকে জানতে হলে নদ-নদীকে জানতেই হবে। বহু হাজা-মজা নদীর দেশ এই জেলা। নদী হেজে যায়, মজে যায়, মরে যায়-তার প্রবাহে। কিন্তু সে থেকে যায় বংশ পরম্পরায় মানুষের মনে এবং পথের প্রান্তের স্মৃতি চিহ্নে।

যুগ যুগ ধরে জেলার চরিত্রের পরিবর্তন ঘটিয়েছে নদ-নদী সমূহ। একদিকে যেমন নদীর ক্ষয়কার্যের ফলে তীরবর্তী অংশসমূহ নদীগর্ভে বিলীন হয়ে গিয়েছে, অপরদিকে তেমনই নদীগর্ভে অধিক পলিমাটি অবক্ষেপণের ফলে নদীর তীরবর্তী অঞ্চলসমূহ নদী থেকে অনেক দূরে সরে গিয়েছে। কোনও কোনও স্থলে আবার নদীর গতির পরিবর্তন ঘটার পলে নদী ছোট-বড় নদীতে বিভক্ত হয়ে অঞ্চল বিশেষ জটাজালের সৃষ্টি করেছে. আবার কোন কোনও স্থলে নদীর গতির পরিবর্তনের ফলে হারিয়ে গেছে প্রাচীন স্রোত এবং পাশাপাশি ঐশ্বর্যশালী গ্রামসমূহ তাদের প্রাচীন সমৃদ্ধিও হারিয়ে ফেলেছে।

দক্ষিণ চব্বিশ পরগণা সহ সুবিস্তৃত সুন্দরবনের নিম্নভূমি বিশাল গাঙ্গেয় ব-দ্বীপ মানব দেহের শিরা উপশিরার মতো ইতস্তত ছড়িয়ে আছে পরস্পরছেদি অসংখ্য নদ-নদী, খাঁড়ি ও প্রণালী। অসংখ্য নদ-নদী, খাল-বিল, অবারিত নীল আকাশের নীচে ষড়ঋতুর শোভায় সুশোভিত, সাগর সৈকতে অবস্থিত এবং শ্যামায়মান বৃক্ষলতা বেষ্টিত এই বর্ধিষ্ণু অঞ্চল। ছোট-বড়, চওড়া-সরু বিভিন্ন আকৃতির জলের স্রোত নিম্নভূমিতে অর্থাৎ সাগরের বুকে মিলনের জন্য ধাবিত হয়ে অসংখ্য চর, খাঁড়ি ও দ্বীপের সৃষ্টি করেছে। নদ-নদী এতদ অঞ্চলের প্রাণ-স্বরূপ, তাই নিম্নগাঙ্গেয় দক্ষিবঙ্গকে

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In Silico Strategy to Control or Treat Nipah Virus Infection in Humans Through Saikosaponin Biomolecules

Dr. Sriparna Ray[1] and Dr. Jayanta Sinha[2*]

[1] Department of Zoology, Bidhan Chandra College, Asansol, West Bengal, India
[2] P.G. Department of Zoology, Vivekananda College, Kolkata, West Bengal, India

Abstract: The penetrance of deadly Nipah virus causing high mortality in humans is mediated by bats and pigs, and there is lack of licensed drugs against it till date. In India the transmittance is caused among humans through direct contamination of secretion and excretion. In order to combat the fatal Nipah virus, so far one strategy has been concerned in this paper; exploiting extract and resources that are of botanical origin. Usually in India, Favipiravir (T-705) is used as anti-viral medicine against Nipah virus. Chemically it is a pyrazinecarboxamide derivative and is an experimental antiviral drug being developed by Toyama Chemical of Japan with activity against many RNA viruses. As Favipiravir is a synthetic analogue, it may cause some side effects in renal function. This paper aims towards identifying various Saikosaponins as an anti-Nipah viral agent and establish its efficacy in binding of these molecules with a viral phosphoprotein. Thus with such an aim and considering the limitation of synthetic drugs, this paper focuses on the interaction between Nipah virus and natural bioactive compounds Saikosaponins (A, B_2, C, D, etc.), which are triterpene glycosides (naturally occurring) being isolated from medicinal plants such as *Bupleurum* spp, *Heteromorpho* spp, and *Scrophularia scorodonia*. Molecular docking of these herbal compounds with Nipah virus phosphoprotein was carried out through Molecular docking server. Lower energy scores represent better binding between Nipah virus phosphoprotein target and Saikosaponins as ligands. It is observed that best binding occurred between Nipah virus and saikosaponins K among the Saikosaponins clearly indicates its importance to be served as a potent drug. Ligplot+ server revealed polar and hydrophobic residues mainly involved in docking.

Keywords: Nipah Virus, In Silico, Bioactive Compounds, Docking, Saikosaponins

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***Corresponding Author**

Dr. Jayanta Sinha , P.G. Department of Zoology, Vivekananda College, Kolkata, West Bengal, India

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