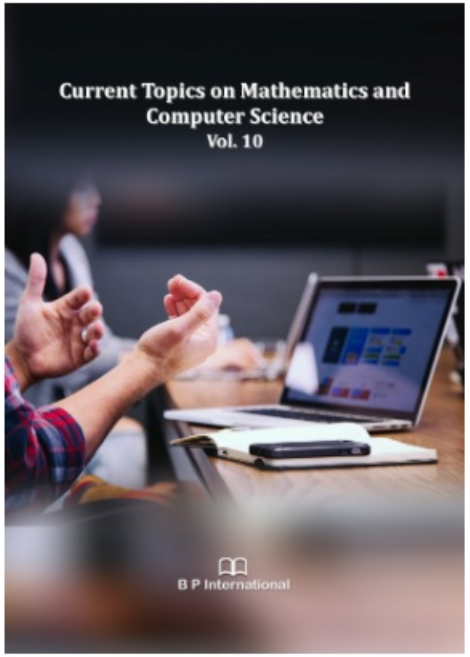
stm.bookpi.org/CTMCS-V10/issue/view/358

Current Topics on Mathematics and Computer Science Vol. 10

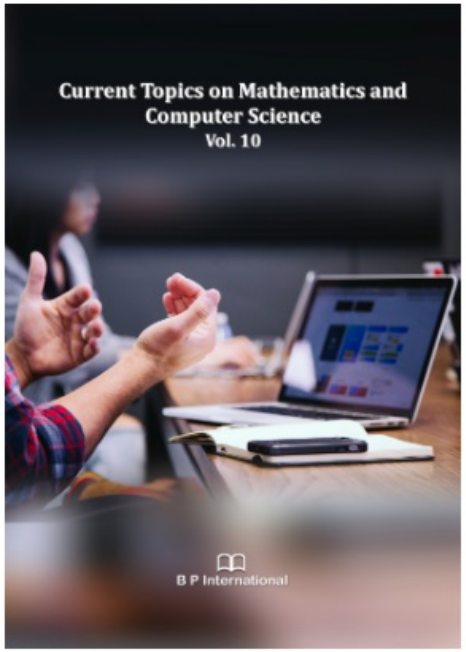


Editor(s)
Dr. Belkacem Chaouchi
Professor,
Department of Mathematics, Faculty of Sciences, Khemis Miliana University, Algeria.

ISBN 978-93-91882-04-4 (Print)
ISBN 978-93-91882-19-8 (eBook)
DOI: 10.9734/bpi/ctmcs/v10

This book covers key areas of mathematics and computer science. The contributions by the authors include entropy coding, Huffman encoding, leveling, lossless data compression, data Mining, land transport infrastructure, machine learning, sentiments analysis, fuzzy primes, primary submodules, radical, fuzzy submodules, orthogonal design, nearly orthogonal design, super saturated design, Hadamard matrix, D-optimality, J2-optimality, fuzzy control, multistage fuzzy control, deterministic object, stochastic object, fuzzy object, stochastic-fuzzy knowledge base, formal Concept Analysis, cryptography, integer factorization, binary tree, algorithm, virtual reality, augmented reality, oculus Rift,

stm.bookpi.org/CTMCS-V10/article/view/3741



Study on Fuzzy Primes and Primary Submodules

Pratibha Kumar

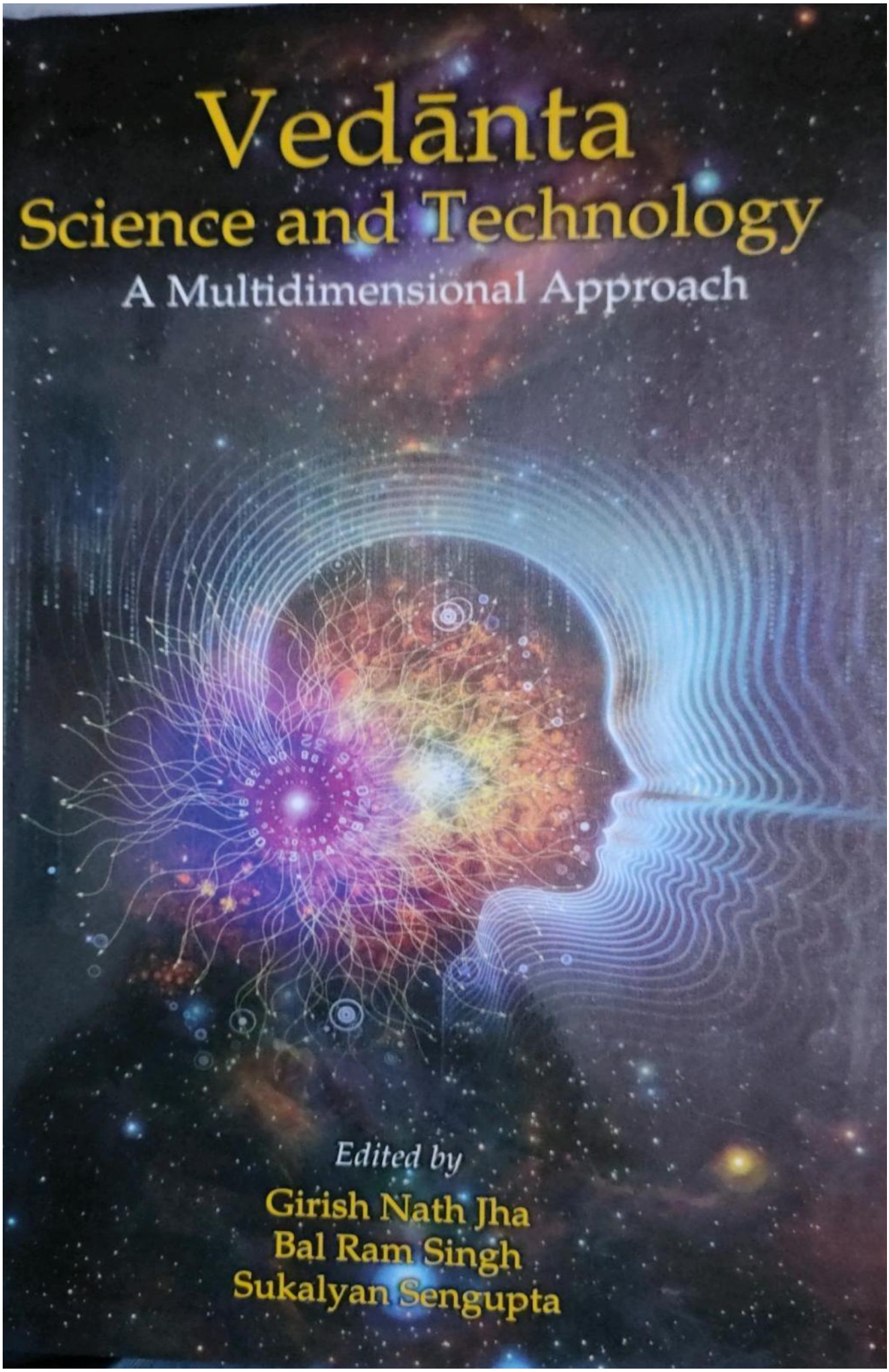
Current Topics on Mathematics and Computer Science Vol. 10, 30 August 2021, Page 35-45
https://doi.org/10.9734/bpi/ctmcs/v10/1890C
Published: 2021-08-30

View Article Cite Share

Abstract

In this chapter the author attempts to fuzzify the concepts of prime, primary submodules and the radical of a fuzzy submodule. These concepts are studied in terms of their level submodules. Some properties of quotient of a fuzzy submodule and the intersection of two fuzzy primary

Vedānta
Science and Technology
A Multidimensional Approach



Edited by

Girish Nath Jha
Bal Ram Singh
Sukalyan Sengupta

Scanned by Scanner Go

Cataloging in Publication Data — DK
[Courtesy: D.K. Agencies (P) Ltd. <docinfo@dkagencies.com>]

International Congress of Vedanta (22nd : 2015 : New Delhi, India)

Vedānta science and technology : a multidimensional approach / edited by Girish Nath Jha, Bal Ram Singh, Sukalyan Sengupta.

pages cm

English, Hindi and Sanskrit.

"Proceeding of the 22nd International Vedanta Congress organized at the Special Center for Sanskrit Studies, Jawaharlal Nehru University, New Delhi during December 27-30, 2015" – Title page verso.

Includes bibliographical references.

ISBN 9788124609477 (Hb)

1. Vedanta – Congresses. 2. Philosophy and science – Congresses. 3. Vedic literature – History and criticism – Congresses. I. Jha, Girish Nath, editor. II. Singh, Bal Ram, editor. III. Sengupta, Sukalyan, editor. IV. Jawaharlal Nehru University. Special Centre for Sanskrit Studies, organizer. V. Title.

LCC B132.V3I58 2021 | DDC 181.48 23

ISBN: 978-81-246-0947-7 (Hb)
First published in India in 2021
© The Editors

CONTRIBUTORS COPY

Proceeding of the 22nd International Vedanta Congress Organized at the Special Center for Sanskrit Studies, Jawaharlal Nehru University New Delhi during December 27-30, 2015.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording or any information storage or retrieval system, without prior written permission of both the copyright owners, indicated above, and the publishers.

Printed and published by:
D.K. Printworld (P) Ltd.
Regd. Office: H-12, Bali Nagar
(Metro Station: Ramesh Nagar), New Delhi 110015
Phones: (011) 2545 3975; 2546 6019
e-mail: indology@dkprintworld.com
Web: www.dkprintworld.com

Scanned by Scanner Go

43. Vedānta and the Varṇa System 599
– *Manjushree Hegde*

44. प्रस्थानत्रयीशांकरभाष्य में कर्म-सिद्धान्त का विश्लेषण 615
– *अनीता लोचिब*

APPLIED VEDĀNTA (YOGA, ĀYURVEDA, ETC.)

45. Vedānta and Yogic Prāṇa-Vidyā 641
– *Shashi Tiwari*

46. Śrīkaṇṭha's Śaivaviśiṣṭādvaita and Śaṅkara's Advaita: Review of Some Concepts 653
– *T. Ganesan*

DIGITAL ACCESS AND RESEARCH OF SANSKRIT TEXTS

47. Editing Unicode Devanāgarī Text through Digital Braille Typewriter 675
– *Diwakar Mishra* and *Bhartendu Pandey*

48. Multimedia and E-Learning-Based Presentation of Sanskrit Heritage Texts: The Case of Śrīmadbhagavadgītā 685
– *Devendra Singh Rajput*

49. Preservation of Science and Technology Manuscripts of Sanskrit: A Technology based Approach 697
– *Devendra Singh Rajput* and *Girish Nath Jha*

50. संस्कृत छन्द शिक्षण हेतु छात्रों एवं शिक्षकों के लिए वेब-आधारित सहायक तन्त्र का विकास 713
– *रवि कुमार मीना एवं सुभाष चन्द्र*

51. वेदान्त ग्रन्थों के अर्थनिर्धारण हेतु नियम एवं उदाहरण संयुक्त विधि का प्रयोग करके संस्कृत सनाद्यन्त क्रियापदों की संगणकीय पहचान एवं विश्लेषण 728
– *भूपेन्द्र कुमार एवं सुभाष चन्द्र*

Scanned by Scanner Go

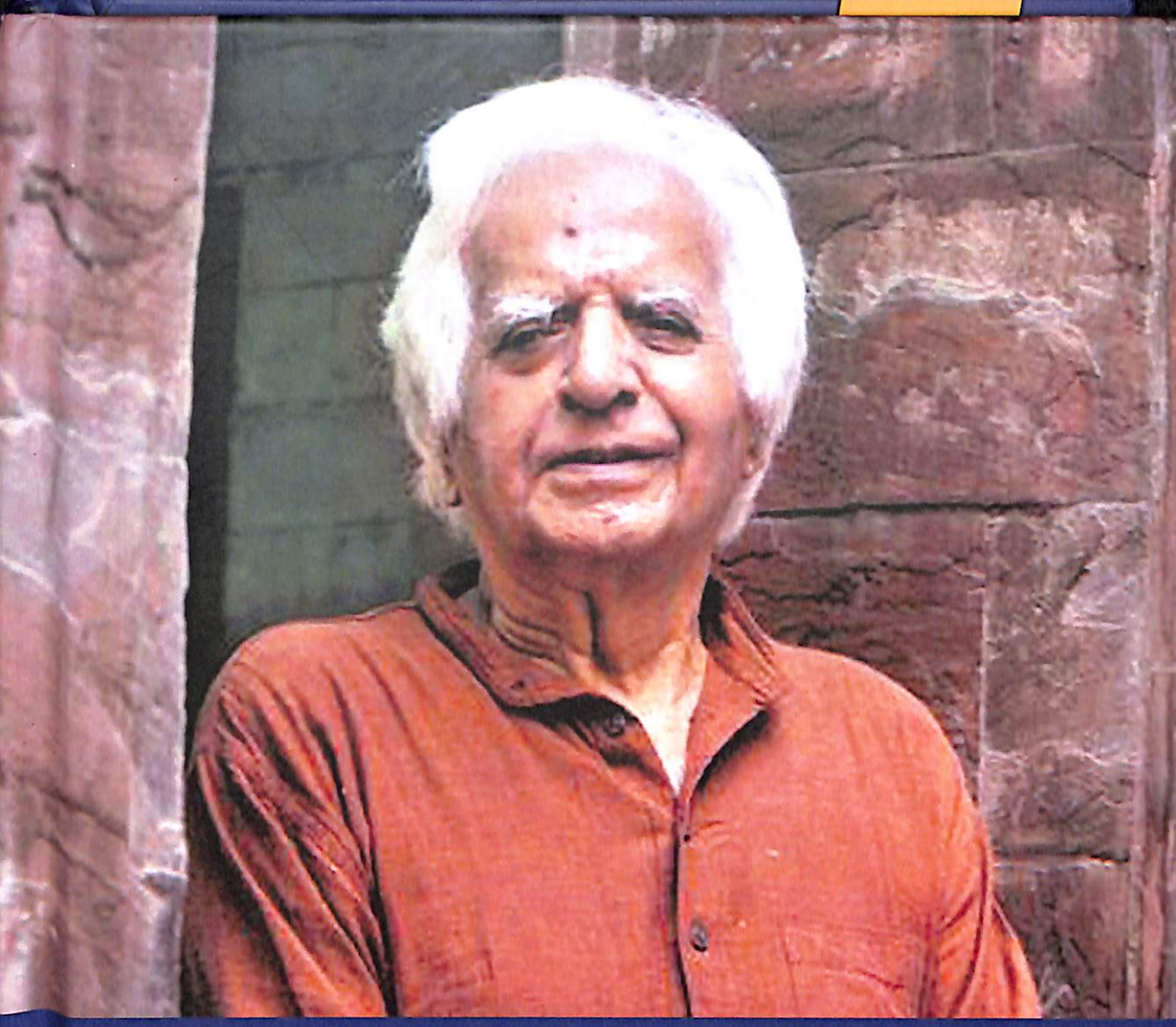
51

वेदान्त ग्रन्थों के अर्थनिर्धारण हेतु नियम एवं उदाहरण संयुक्त विधि का प्रयोग करके संस्कृत सनाद्यन्त क्रियापदों की संगणकीय पहचान एवं विश्लेषण

भूपेन्द्र कुमार
सुभाष चन्द्र

संक्षेप : प्राचीन साहित्य में प्रचुरता से वैज्ञानिक एवं तकनीकी अनुसन्धानों एवं आविष्कारों की अवधारणाएँ प्राप्त होती हैं, क्योंकि प्राचीन भारतीय ग्रन्थ संस्कृत भाषा में लिखे गए हैं तथा वैज्ञानिक प्रगति की दृष्टि से प्राचीन भारत समृद्ध था। वैदिक साहित्य से लेकर लौकिक साहित्य तक सब के सब तत्कालीन वैज्ञानिक अवधारणाओं से ओत-प्रोत हैं। इन सभी ग्रन्थों को समझने के लिए व्याकरण का ज्ञान होना अत्यावश्यक है। व्याकरण के ज्ञान बिना सही अर्थ का पता लगाना मुश्किल सा लगता है। संस्कृत व्याकरण या किसी अन्य भाषा के व्याकरण में क्रियापद की मुख्य भूमिका होती है। संस्कृत भाषा में मुख्य रूप से दो प्रकार की क्रियाएँ प्राप्त होती हैं । प्रथम वे जिन्हें पाणिनि ने *धातुपाठ* में उल्लिखित किया है उन्हें प्राथमिक क्रिया (primary verb forms) कहते हैं। द्वितीय वे जिन्हें गौण क्रिया (secondary verb forms) कहा जाता है जो धातु या सुबन्त से सनादि बारह प्रत्ययों के योग से विभिन्न नए अर्थों (*धातुपाठ* में उल्लिखित धातुओं से भिन्न अर्थों) में प्रयोग के लिए बनती हैं। प्रस्तुत शोध-पत्र में इन्हीं गौण क्रियापदों की संगणकीय अभिज्ञान एवं विश्लेषण के लिए एक वेब-आधारित सिस्टम का विकास करने के लिए नियम एवं उदाहरण संयुक्त विधि प्रस्तावित की गई है। जिसके माध्यम से संस्कृत भाषा में प्रयुक्त गौण क्रियाओं की पहचान एवं विश्लेषण किया जा सके । वेदान्त साहित्य में भी इस प्रकार की क्रियापदों के खूब प्रयोग हुए हैं। अत: वेदान्त ग्रन्थों में इस प्रकार के पदों के अर्थ निर्धारण हेतु पाठक के लिए यह सिस्टम सहायक सिद्ध होगा। यह सिस्टम ऑनलाइन होगा जिसका किसी भी समय कहीं से भी इण्टरनेट के माध्यम से प्रयोग किया जा सकेगा ।

Scanned by Scanner Go



WRITER IN CONTEXT

JOGINDER PAUL

THE WRITERLY WRITER

Edited by
CHANDANA DUTTA

SOUTH ASIA EDITION

ROUTLEDGE
A Routledge India Original

LITERATURE / POSTCOLONIAL LITERATURE / INDIAN LANGUGES / CULTURAL STUDIES

Cover image: *Joginder Paul (1925–2016)*
Cover design by YaWeDo

an **informa** business

Routledge
Taylor & Francis Group
www.routledge.com

Routledge titles are available as eBook editions in a range of digital formats

₹ 1495
ISBN 978-1-032-33270-3

This edition is for sale in India, Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka only.

32 Transfusion as Translation: *Ek Boond Lahu Ki* Becoming *A Drop of Blood* 225
SNEHAL SHINGAVI

33 To See or Not to See: Some Thoughts, Some Notes 232
SUKRITA PAUL KUMAR

34 Trans-Creating the Pain of Displacement and Denial: *Khwabrau* into *Sleepwalkers* 236
SUNIL TRIVEDI

35 From *Paar Pare* to *Beyond Black Waters* 240
VIBHA S. CHAUHAN

36 Translating Joginder Paul 244
MEENAKSHI BHARAT

37 Translating Joginder Paul: A Sleepwalker's Dream 248
KEERTI RAMACHANDRA

SECTION VII
From the Archives: Documenting Joginder Paul 253

38 "Study of a Literary Work: A Critical Practice" A Letter to the Editor of *Tulu-e-Afkar* 255
JOGINDER PAUL
TRANSLATED BY MOHAMMAD ASIM SIDDIQUI

SECTION VIII
The Logs of a Life 259

39 Joginder Paul: A Bibliographical Chronology 261
COMPILED BY ABU ZAHIR RABBANI

Joginder Paul: A Detailed Bibliography 273
List of Contributors 277
Index 282

35

From *Paar Pare* to *Beyond Black Waters*

Vibha S. Chauhan

'How many times have I told you to say *rast* things to me and not to speak in your Arbee-Pharsee tongue,' complains a character Gaura to her husband Baba Lalu in Joginder Paul's Urdu novel *Paar Pare*, translated by me into English as *Beyond Black Waters*. The fictional locale of the novel is the present city of Port Blair in Andamans Island where the British had established a penal colony. The suppression of the Indian Uprising of 1857 saw a large number of executions of protestors. Many others were exiled to Kala Pani, or the Andamans, across the ocean, with little hope of ever returning.

Paar Pare is the story of displacements as well as new settlements. The events of the novel are largely centred around the Kissonwali Gali, the street of stories. Most original inhabitants on this street had been prisoners at the Cellular Jail, who after their sentence decided to stay on in the Andamans. The original inhabitants of Kissonwali Gali thus had come from different regions of mainland India and resettled in close proximity with each other. The most natural outcome of this kind of congregation was coexistence, with its extended outcome, which is the commingling of cultures, tongues, idioms, rituals, and beliefs. These permeate space, erode boundaries, and generate fresh cultures, languages, and rituals.

This fact became extremely significant for me as the translator of *Paar Pare* that it was not just brimming with many different languages but also with multiple variants and registers of the same language. That is exactly what Gaura hints at when she tells Baba Lalu to say *rast* things and not use his 'Arbee-Pharsee' by which she means the language used by those who are formally educated. By *rast* she clearly means the 'popular,' commonplace use of the language. Baba Lalu, however, further complicates the linguistic map by pointing to Gaura that the word *rast* is nothing but 'Pharsee for straight.' The mixing of different registers is clear and so is the versatility of languages as they mingle and get recreated.

The characters in *Paar Pare* not just come from different regions but also from different socio-economic groups and professions. While some have been interned for political activism, others have been imprisoned for different kinds of crimes ranging from petty theft to murder. They carry their

DOI: 10.4324/9781003092674-54

Indrakant K. Singh
Archana Singh *Editors*

Plant-Pest Interactions: From Molecular Mechanisms to Chemical Ecology

Springer

Copyrighted material

Editors
Indrakant K. Singh
Molecular Biology Research Lab
Deshbandhu College, University of Delhi
New Delhi, India

Archana Singh
Department of Botany
Hans Raj College, University of Delhi
New Delhi, India

ISBN 978-981-15-2466-0 ISBN 978-981-15-2467-7 (eBook)
https://doi.org/10.1007/978-981-15-2467-7

© Springer Nature Singapore Pte Ltd. 2021
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Copyrighted material

Contents

Role of Herbivore-Associated Molecular Patterns (HAMPs) in Modulating Plant Defenses 1
Garima Malik, Ritu Chaturvedi, and Sunila Hooda

Transcriptomics Studies Revealing Enigma of Insect-Plant Interaction 31
Sujata Singh, Archana Singh, and Indrakant K. Singh

Plant–Insect Interaction: A Proteomic Approach in Defence Mechanism 57
Anjana Rustagi, Samira Chugh, Shweta Sharma, Punam Kumari, and Deepak Kumar

Role of miRNA in Plant Defense Against Insects 73
Jinu Jacob, P. Madhu, and R. Vinodh

Role of Mapks During Plant-Insect Interaction 93
Kaur Manjeet and Sunita Yadav

Thioredoxins as Molecular Players in Plants, Pests, and Pathogens 107
Pragati Kumari, Arvind Gupta, and Saurabh Yadav

Plant Volatiles and Their Role in Insect Olfaction 127
Muhammad Binyameen, Qasim Ali, Amit Roy, and Fredrik Schlyter

Direct and Indirect Defence Against Insects 157
Anupama Razdan Tiku

Signalling During Insect Plant Interaction 193
Vibha Gulyani Checker and Meenakshi Sharma

Role of Phytohormones in Plant Defence Against Insects: Signalling and Crosstalk 215
A. R. Sakthi, C. Selvi, and R. Poorniammal

Plant Proteinase Inhibitor and Protease Interaction During Insect-Plant Communication 233
Mahaswetta Saikia and Rakesh Kumar

Copyrighted material

Signalling During Insect Plant Interaction

Vibha Gulyani Checker and Meenakshi Sharma

2020

Abstract

Insects and plants share refined interactions as plants recognize insects via mechanical and chemical hints. The initial response begins at plant cell membrane. Insects interact physically with the membrane and triggers production of signalling molecules in the plant. Herbivore contact causes charge distribution differences across the membrane which eventually leads to calcium signalling cascade. Generation of reactive oxygen and nitrogen species also follows membrane depolarization. Multiple hormone response pathways leads to appropriate responses, but the primary signalling cassette mediating the information received at the plant-insect interface and starting defence responses in plants is the jasmonate (JA) pathway. Defence responses are initiated by the accumulation of several secondary metabolites and defence proteins. Plants differently prioritize defence response at different developmental stages. Plants release volatile cues to mediate ecological interactions, and these metabolites play pivotal role in plant-herbivore interactions.

Keywords

Ion flux · Calcium · ROS · RNS · JA · SA · Volatiles

Uncorrected Proof

Springer Proceedings in Materials

Saluru Baba Krupanidhi
Vinay Gupta
Anjali Sharma Kaushik
Anjani Kumar Singh *Editors*

Advanced Functional Materials and Devices

Select Proceedings of AFMD 2021

Springer

Advanced Functional Materials and Devices pp 1–16

Electrocatalytic Properties of ZnO Thin Film Based Biosensor for Detection of Uric Acid

Kajal Jindal, Vinay Gupta & Monika Tomar

Conference paper | First Online: 02 December 2021

228 Accesses

Part of the Springer Proceedings in Materials book series (SPM,volume 14)

Abstract

A novel uric acid biosensor employing ZnO thin film as matrix is developed using pulsed laser deposition technique. The dependence of electrocatalytic properties of ZnO thin films on the ZnO processing pressure during growth is studied. It has been observed that the growth kinetics of ZnO matrix play a critical role in governing the electron transfer characteristics of ZnO thin film based biosensors. It is found from the cyclic voltammetric measurements that the peak oxidation current of ZnO/ITO/glass electrode increases with a rise in pressure of ambient gas from 1 to 100 mT and is maximum (548 μA) for ZnO

thin film based electrode prepared in an oxygen ambient of 100 mT. The variation in peak current with change in processing pressure is attributed to the change in surface properties, which largely depends on the mean free path and kinetic energy of ablated species arriving at the substrate. The optimized ZnO thin film (100 mT) offers high surface coverage (9.74×10^{-9} mol/cm^2) during immobilization of uric acid resulting in a sensitivity of 122 μA/(mM-cm^2). In addition, the prepared ZnO based biosensor exhibit high affinity towards detection of uric acid (K*m*~0.07 mM), low limit of detection (0.01 mM) along a storage stability of more than 20 weeks. Thus, the present work suggests an important role of plume kinetics for the fabrication of ZnO thin film based biosensors.

Keywords

Uric acid **Zinc oxide** **Biosensor**

This is a preview of subscription content, access via your institution.

Chapter EUR 29.95

Price includes VAT (India)

- DOI: 10.1007/978-981-16-5971-3_1
- Chapter length: 16 pages
- Instant PDF download
- Readable on all devices
- Own it forever
- Exclusive offer for individuals only
- Tax calculation will be finalised during checkout

Buy Chapter

screen-printed electrode coated with Prussian blue and modified with chitosan-graphene composite cryogel. Microchem J 154:104624

29. Numnuam A, Thavarungkul P, Kanatharana P (2014) An amperometric uric acid biosensor based on chitosan-carbon nanotubes electrospun nanofiber on silver nanoparticles. Anal Bioanal Chem 406(15):3763–3772

Acknowledgements

Authors are thankful to University of Delhi for providing research facilities.

Author information

Authors and Affiliations

Department of Physics, Kirori Mal College, University of Delhi, Delhi, 110007, India
Kajal Jindal

Department of Physics and Astrophysics, University of Delhi, Delhi, 110007, India
Vinay Gupta

Department of Physics, Miranda House, University of Delhi, Delhi, 110007, India
Monika Tomar

Editor information

Editors and Affiliations

.RIS .ENW .BIB

DOI
https://doi.org/10.1007/978-981-16-5971-3_1

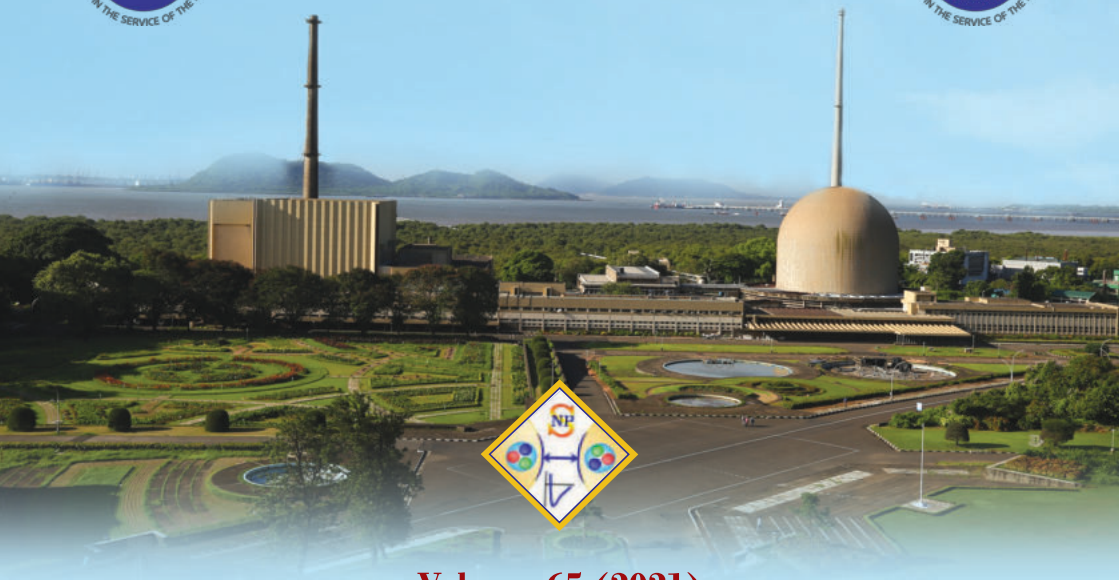
Published	Publisher Name	Print ISBN
02 December 2021	Springer, Singapore	978-981-16-5970-6

Online ISBN	eBook Packages
978-981-16-5971-3	Chemistry and Materials Science Chemistry and Material Science (R0)

Not logged in - 122.161.52.244
Not affiliated
SPRINGER NATURE

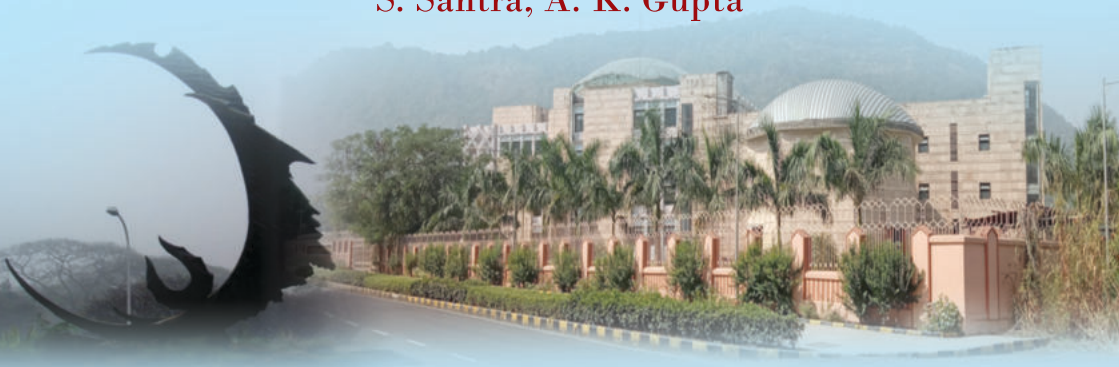
© 2022 Springer Nature Switzerland AG. Part of Springer Nature.

65th DAE BRNS SYMPOSIUM ON NUCLEAR PHYSICS



Volume 65 (2021)
DAE Convention Centre Anushaktinagar, Mumbai
December 1 - 5, 2021

Editors
Yogesh K. Gupta, R. R. Sahu,
S. Santra, A. K. Gupta



Sponsored by
Board of Research in Nuclear Sciences,
Department of Atomic Energy, Government of India

Contact : Yogesh K. Gupta
R. R. Sahu
S. Santra
A. K. Gupta

Printed by : Prudent Arts & Fab Pvt. Ltd.
A-221, TTC Industrial Area,
Opp. Anthony Motors Pvt. Ltd.,
M.I.D.C., Mahape, New Mumbai - 400701
Tel : +91 99302 00043 / 42`

ISBN 818372084-6

Validity of Chemical Equilibrium Approach in the Study of Kinetic Freeze-out in p-Pb Collisions at LHC

A. Hamid Nanda[a],* Saeed Uddin [a], Agam K. Jha [b], and Inam Bashir [c]
[a] *Computational High Energy lab, Jamia Millia Islamia University, Delhi-110025, INDIA*
[b] *Department of Physics, Kirori Mal College, Delhi University, INDIA and*
[c] *Govt. Higher Secondary School, Pulwama Tral J & K, INDIA*

Transverse momentum spectra of identified pions ($\pi^- + \pi^+$), kaons ($(K^- + K^+), K^0_s$), protons ($p + \bar{p}$) and lambdas ($\Lambda + \bar{\Lambda}$) produced at mid-rapidity ($0 < y_{cm} < 0.5$) in p-Pb collisions at $\sqrt{S_{NN}} = 5.02$ TeV is studied for different collision centralities by using a Unified Statistical Thermal Freeze-out Model (USTFM). A fairly good agreement is seen between the calculated results and the experimental data points taken from the ALICE experiment. Kinetic freeze-out conditions are extracted from the fits of the transverse momentum spectra of these hadrons for each centrality class. A comparison of the obtained freeze-out parameters with those of heavy-ion collisions ($Pb+Pb$) is made and discussed.

1. Introduction

The p_T distributions and yields of particles of different masses at low and intermediate momenta of less than a few GeV (3-4 GeV) can provide important information about the system created in high energy hadron reactions. This is because a vast majority of the particles is produced in this soft region where a thermally equilibrated system is expected to be formed. The measurement of charged kaons is a significant tool to further understand the thermalization of the system and the mechanism of strangeness production in these collisions. In our previous analysis [1], we have studied the particle production in p-p and Pb-Pb collisions at LHC by employing a phenomenological Unified Statistical Thermal Freeze-out Model. Significant collective flow effects were seen in both the cases which gave a support to the assumption of almost complete thermalization of the produced system in these collisions at LHC. It will therefore be interesting to study the medium properties of the system produced in p-Pb collisions which may be treated as the intermediate between p-p and p-Pb collision systems. In order to address the particle production in the QCD matter produced in p-Pb collisions, a systematic study of the identified particles over a broad p_T range is required. We, therefore in this analysis, have used the same phenomenological approach to reproduce the mid-rapidity ($0 < y_{cm} < 0.5$) p_T - distributions of identified particles produced in p-Pb collisions at the LHC energy of $\sqrt{S_{NN}} = 5.02$ TeV.

The Model

In our model it is assumed that the system reaches a state of thermo-chemical equilibrium at freeze-out. The momentum distributions of hadrons, emitted from within an expanding fireball, are characterized by the Lorentz-invariant Cooper-Frye formula [2] as

$$E\frac{d^3n}{d^3p} = \frac{g}{(2\pi)^3}\int f\left(\frac{p^\mu u^\mu}{T}, \lambda\right) p^\mu d\Sigma_f \quad (1)$$

where Σ_f represents a 3-dimensional freeze-out hyper-surface and g = 2j+1 is the degree of degeneracy of the expanding relativistic hadronic gas and $\lambda = \exp(\mu/T)$ is the fugacity. The invariant cross-section will have the same value in all the Lorentz frames, i.e $E\frac{d^3n}{d^3p} = E'\frac{d^3n}{d^3p'}$. The transverse velocity component of the hadronic fireball, β_T is assumed to vary with the transverse coordinate r in accordance with the Blast Wave model as $\beta_T(r) = \beta^s_T(r/R)^n$ where n is an index which fixes the profile of $\beta_T(r)$ in the transverse

*Electronic address: hamid_heptheory@yahoo.com

direction and β_T^s is the hadronic fluid surface transverse expansion velocity and is fixed in the model by using the parameterization $\beta_T^s = \beta_T^0\sqrt{1-\beta_z^2}$. This relation is also required to ensure that the net velocity β of any fluid element must satisfy $\beta = \sqrt{\beta_T^2+\beta_z^2} < 1$. Assuming a Boltzmann type of contribution for the parent (decaying) particles, the contribution of resonance particle decay to the final state particle transverse momentum spectra can be calculated from the equation $E^{'}\frac{d^3n}{d^3p^{'}} = \frac{1}{2p^{'}}\left\{\frac{m_h}{p^*}\right\}\lambda_h g_h \exp(-\alpha\theta E^{'}E^*)$ $\left[\frac{\alpha}{\theta}\left\{E^{'}E^*\sinh(\alpha\theta p^{'}p^*) - p^{'}p^*\cosh(\alpha\theta p^{'}p^*)\right\}+ T^2\sinh(\alpha\theta p^{'}p^*)\right]$ where α and θ are given by m_h/m^2 and $1/T$, respectively. The subscript h in the above equation stands for the decaying (parent) hadron. The two body decay kinematics gives the product hadron's momentum and energy in the "rest frame of the decaying hadron" as $p^* = (E^{*2}-m^2)^{1/2}$ and $E^* = \frac{m_h^2-m_j^2+m^2}{2m_h}$ where m_j indicates the mass of the other decay hadron produced along with the first one

2. Results

TABLE I: Kinetic freez-out parameters obtained for different particles at different centralities

Particle	Centrality	β_0^T	T(MeV)
$(\pi^- + \pi^+)$	(0-5)%	0.95 ± 0.01	75 ± 2
	(80-100)%	0.93 ± 0.02	67 ± 3
$(K^- + K^+)$	(0-5)%	0.93 ± 0.01	133 ± 2
	(80-100)%	0.72 ± 0.02	120 ± 3
K_s^0	(0-5)%	0.87 ± 0.01	143 ± 2
	(40-60)%	0.82 ± 0.02	149 ± 3
$(p+\bar{p})$	(0-5)%	0.87 ± 0.01	149 ± 3
	(80-100)%	0.77 ± 0.01	122 ± 3
$(\Lambda+\bar{\Lambda})$	(0-5)%	0.77 ± 0.01	162 ± 1
	(80-100)%	0.66 ± 0.02	185 ± 3

It is seen from the table I that a significant value of collective flow is observed for all the studied particles in case of p-Pb collisions at LHC. This hints towards the thermalization of the produced system in p-Pb collisions and the possible formation of Quark Gluon Plasma in p-Pb collisions at LHC [3] at the early stage of the collisions.

3. Summary and Conclusions

In summary, we have successfully reproduced the mid-rapidity ($0 < y_{cm} < 0.5$) p_T spectra of pions ($\pi^- + \pi^+$), kaons (($K^- + K^+$), K_s^0), protons ($p+\bar{p}$) and Lambdas ($\Lambda + \bar{\Lambda}$) produced in p-Pb collisions at LHC and compared with the predictions of Unified Statistical Thermal Freeze-out Model (USTFM). A reasonably good agreement between the theoretical results and the experimental data hints at the almost complete thermalization of the produced system. Centrality dependence of the freeze-out parameters is studied and it is seen that the collective flow of all hadronic species show a slow decrease towards peripheral collisions which is also seen in the nucleus-nucleus collisions at LHC and RHIC. The thermal freeze-out temperature of lighter particles, such as pions and Kaons, shows a quite different behavior with changing centrality as compared to that found in heavy-ion collisions. Baryons are found to show a consistent increase in temperature and decrease in collective flow effects towards peripheral collisions, a pattern observed in the nucleus-nucleus collisions also at LHC and RHIC. The p-Pb system is thus seen to behave more or less like a heavy-ion collision system.

Acknowledgments

We are very thankful to the department of Physics, Jamia Millia University for providing us a good lab facility.

References

[1] S. Uddin et al., Adv. in High energy phys., 2015, Article ID 154853, 7 pages (2015)
[2] F.Cooper and G.Frye,1974, Phys.Rev.D,186-189
[3] S.A. Bass et al. , Nucl. Phys. A661, 205 (1999).