

Vidwan P.G. Nair Memorial Endowment

Preamble

We, Dr. M.G. Kaladharan Nayar, Dr. M.G. Sarngadharan, Smt. M.P. Kamalamma, Smt. M.P. Mohanakumari, Smt. M.P. Hymavathy, and Dr. M.P. Bhamini, the children of the late P. Gopalan Nair,

Deeply aware of the human and humanitarian values he cherished,

Conscious of the zeal with which he strived by teaching and educating to promote respect for fundamental human values as a basis for individual and social progress and the free flowering of the human mind,

Especially aware of his faith in the importance of education in understanding the significance of life and in preserving and enhancing the dignity and worth of the human person,

Also aware of his life-long devotion to literature and his remarkably unique contribution to the development of Malayalam literature,

Determined to perpetuate the memory of his life and work and to create opportunities for growth and development for succeeding generations,

Do hereby enter into a contract with the Union Christian College, Aluva, Kerala, to establish an endowment to be known as Vidwan P.G. Nair Memorial Endowment

Contract

This agreement is made on the 31st day of March, 2000 between the above-mentioned children of the late P. Gopalan Nair, hereinafter referred to as the "First Party" of the one part,

AND

The Union Christian College, Aluva, Kerala, India, hereinafter referred to as the "Second Party" of the other part.

The Parties agree upon the following terms:

An Endowment will be established at the Union Christian College, Aluva, Kerala, to be known as the Vidwan P.G. Nair Memorial Endowment. This Endowment will consist of two parts, namely,

a Fellowship to be known as the Vidwan P.G. Nair Memorial Fellowship and a Loan Scholarship to be known as the Vidwan P.G. Nair Memorial Loan Scholarship. The objects and purposes and the manner of operation of the Fellowship and the Loan Scholarship are described below.

I. Fellowship Program Endowment and Objectives

1. The Endowment amount of Rs. 11,00,000.00 shall be funded by the First Party and maintained by the Second Party as a separate fixed deposit in a commercial bank or other financial institution approved by the Reserve Bank of India, and the interest accruing from that deposit shall be utilized for awarding the Vidwan P.G. Nair Memorial Fellowship, and to defray the appropriate expenses in the implementation of the Fellowship program. These expenses may include advertisements, necessary traveling allowance, honorarium for referees, stationery, and clerical assistance.
2. The Second Party shall administer the Fellowship Program to pursue the objects and purposes of the Fellowship consistent with the basic principles stated in the preamble.

II. Vidwan P.G. Nair Memorial Fellowship

1. The Fellowship is to support brilliant research scholars in Malayalam, to work on proposals submitted to the Research Center at the Department of Malayalam in the Union Christian College, Aluva, Kerala.
2. The Fellowship is meant to be a mark of distinct honor and one that would attract outstanding candidates not merely to become scholars in their chosen specialization but to fully develop into incorruptible individuals with integrated intelligence.
3. There shall be no geographic restrictions on eligibility. Any scholar interested in pursuing advanced studies in Malayalam literature is eligible to apply for the Fellowship.
4. The announcements inviting applications for the Fellowship shall be widely publicized among institutions of higher education in Kerala, and shall be advertised in the national newspapers by Union Christian College.
5. The work supported by the Fellowship may be used towards the requirement for an advanced degree and/or may be published. Fellowship Awardees shall make proper acknowledgment of the Fellowship in all writings (including dissertations towards degree requirements), or public presentations using this work.
6. The project shall be completed at the Research Center at the Union Christian College, and the Fellowship Awardee shall submit periodic reports of his/her work to the Research Center.
7. The award shall be consistent with the values and standards of excellence cherished by the late Vidwan P.G. Nair. A committee of eminent scholars with impeccable integrity shall review the credentials of the candidates for the Fellowship and recommend the award to a truly meritorious applicant. A five-member Fellowship Selection Committee shall be constituted as follows:

- 1.) The Principal, Union Christian College, Aluva (ex-officio)
- 2.) The Head of the Department of Malayalam, Union Christian College, Aluva (ex-officio)
- 3.) A nominee of the late Vidwan P.G. Nair's family (the First Party)
- 4.) Two experts in Malayalam literature. These two experts shall be selected by consensus by a sub-committee formed for this purpose; this sub-committee shall consist of the Manager (ex-officio) and the Principal (ex-officio) of Union Christian College, and the nominee of the Vidwan P. G. Nair Family, and the selection of the experts shall be as follows:
 - i) An eminent literary scholar in Malayalam from a panel of three to be nominated from the Kerala Sahitya Academy.
 - ii) One expert from a pool of experts nominated by the Vice Chancellors of the Universities in Kerala. The Universities shall be requested to nominate up to two experts to be included in this pool.
8. Members of the immediate family of the Executive Management of Union Christian College and of the members of the Fellowship Selection Committee and relatives of the Vidwan P. G. Nair Family shall be ineligible for the Fellowship consideration.
9. The value of the Fellowship will be Rs. 6000.00 per month. In the future, the amount of the Fellowship may be reassessed to be comparable with the prevailing University Grants Commission (UGC) fellowship. The Fellows may be eligible for additional funds for travel related to their research project, up to Rs. 10,000 annually.
10. The duration of the Fellowship shall be one year and may extend up to three years, provided that significant progress is demonstrated based on an annual evaluation by the Research Center of the College.
11. Initially, there will be only one Fellowship at any given time. However, depending on the availability of funds, there could be multiple concurrent Fellowships in the future.
12. If in the Fellowship Selection Committee's opinion no outstanding applicant is available in any particular review cycle, an award must not be made during that period.
13. The Endowment may allocate additional funding to the College to provide the Fellows with necessary books, journals, access to research work through the Internet and other appropriate study sources. Such acquisitions shall be made through the College, and shall remain the property of the College library.
14. The Second Party shall provide the First Party with an annual statement of accounts indicating the state of the Endowment Fund and detailing the purposes for which the funds under the Endowment have been utilized.
15. The Fellowship Selection Committee shall perform an annual review of the operation of the Fellowship Program, including the purposes for which the Endowment funds have been utilized. The Second Party shall provide the First Party with a report of that review.

III. Vidwan P.G. Nair Memorial Loan Scholarship

1. In addition to the Fellowship Program described in Sections I and II above, funds in the amount of Rs. 2,00,000.00 shall be provided by the First Party and maintained by the Second Party as a separate fixed deposit in a commercial bank or other financial institution approved by the Reserve Bank of India. The interest accruing from that deposit shall be utilized for awarding the Vidwan P.G. Nair Memorial Loan Scholarship.
2. The Loan Scholarships will be awarded to needy students of the College. The College scholarship committee/administration will be responsible for identifying such students, awarding the scholarship, and administering the awards, including the recovery of the loans.
3. The Second Party shall provide the First Party with an annual statement of the loans granted and recovered under the Loan Scholarship Program.

IN WITNESS WHEREOF, the parties have executed this Agreement on the day first above written.

M. G. Kaladharan Nayar
M.G. Kaladharan Nayar, J.S.D.,
Representing the Children of
P. Gopalan Nair

6/6/2000
Date

Rajan Varughese
For and on behalf of
Union Christian College, Aluva
Rajan Varughese, Ph.D., Principal

31/3/2000
Date

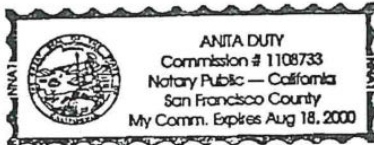
at San Francisco, California

at Alwaye

ALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California
County of San Francisco
On June 6, 2000 before me, Anita Duty, Notary Public
Date Name and Title of Officer (e.g., "Jane Doe, Notary Public")
personally appeared M. G. Kulatharan Nayer, J.S.D.
Name(s) of Signer(s)

☐ personally known to me – OR – ☒ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.



WITNESS my hand and official seal.

Anita Duty
Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of Attached Document

Title or Type of Document: Vidwan P.G. Nair Memorial Endowment Agreement

Document Date: March 31, 2000 Number of Pages: 4

Signer(s) Other Than Named Above: Rajan Varughese, Ph.D. on behalf of
Union Christian College, Aluva

Capacity(ies) Claimed by Signer(s)

Signer's Name: M. G. Kulatharan

- ☒ Individual
☐ Corporate Officer
Title(s): _____
☐ Partner — ☐ Limited ☐ General
☐ Attorney-in-Fact
☐ Trustee
☐ Guardian or Conservator
☐ Other: _____

Signer Is Representing:

**RIGHT THUMBPRINT
OF SIGNER**
Top of thumb here



Signer's Name: _____

- ☐ Individual
☐ Corporate Officer
Title(s): _____
☐ Partner — ☐ Limited ☐ General
☐ Attorney-in-Fact
☐ Trustee
☐ Guardian or Conservator
☐ Other: _____

Signer Is Representing:

**RIGHT THUMBPRINT
OF SIGNER**
Top of thumb here



Report of Vidwan P.G. Nair Endowment Agreement with Department of Malayalam, Union Christian College, Aluva

P. Gopalan Nair Endowment was created by the four children of late P.G. Nair, with a determination to perpetuate the memory of his life by contributing to the development of succeeding generations. The agreement is made on 31st of March, 2000. The Endowment agreement consists of two parts namely a Fellowship known as the Vidwan P. G. Nair Memorial Fellowship and a Loan Scholarship. The fellowship is to support brilliant research scholars to work on proposals submitted to Research Centre at the department of Malayalam in Union Christian College and the loan scholarship is about providing scholarships to needy students of the department.

Report of activities with Proof

Under agreement with Vidwan PG Nair Memorial endowment, the following activities are done by the department of Malayalam

- Conducting 2-3 days' seminars annually
- Publishing papers/ journals from the papers presented in seminars
- Resource mobilization for research up to ₹1,20,000 every year

The photos show the granting of research award and inauguration of a seminar under this endowment.





Outcome of the activities

The endowment has given a big platform and foundation for the Malayalam department to conduct a three-day national seminar and make one publication from the papers presented. Further the research grant provided to deserving students promotes research and scholarship in Malayalam.

The Vidwan P.G. Nair Smaraka Gaveshana Kendram (Vidwan P.G. Nair Research Centre) has made a profound impact in the sphere of higher research and knowledge-making in the state of Kerala. A total of 9 fellows had submitted thesis as part of Vidwan P.G. Nair Research Centre. Department has initiated research in critical areas and undertook the publication of books and journals. We ardently follow interdisciplinary research methods and practices.

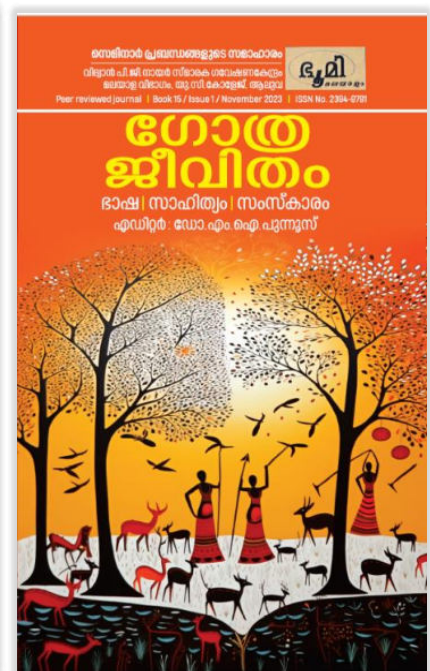
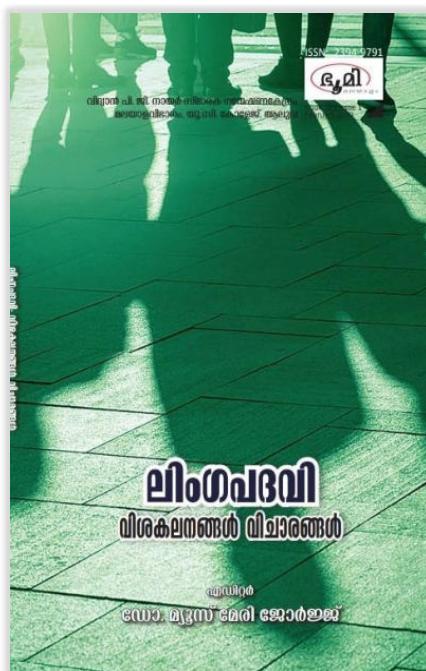
Bhoomi Malayalam Research Journal

Since 2007, every year the department selects a key theme for discussions and subsequent seminars in that year, and at the end of the year organize a three-day national seminar under Vidwan P.G. Nair Research Centre and publishes the documents in the form of a journal called 'Bhoomi Malayalam' which carries an ISSN number (ISSN 2394-9791). The quality of papers presented to exhibit the real academic spirit of the department. The journal has been accepted as a reference journal in many universities in Kerala. The outcome is that a key theme which requires academic attention will be examined in detail by scholars from various perspectives, and papers will be brought out for broader circulation and readership. 15 issues of the Journal published so far since its inception.



Bhoomi Malayalam Research Journal Issues published during 2018-2023

Book 10/Issue 1/ February 2018 Coloniyananthara vadam Editor : - Dr. Shimi Paul Baby; Book 11/Issue 1/ February 2019 Malayala Novel Editor Dr. Saju Mathew; Book - 12/Issue - 1/ February 2020 "Cinema Kalayum Rashtreyavum" edited by Dr. Sibu M. Eapen; Book - 13/Issue - 1/ February 2021 Lingapadavi- Editor Dr. Muse Mary George; Book - 14/Issue - 1/ March 2022 Bhashasasthram puthukalam puthuvazhikal Editors:-Dr. V.P.Markose & Dr. Vidhu Narayan; Book -15/Issue - 1/ November 2023 Gothrajeevitham, Editor: - Dr. M.I.Punnoose;





HOPE COLLEGE

DEPARTMENT OF PHYSICS

MEMORANDUM OF UNDERSTANDING
DEPARTMENT OF PHYSICS, UNION CHRISTIAN COLLEGE, ALUVA, INDIA
AND
DEPARTMENT OF PHYSICS, HOPE COLLEGE, MICHIGAN, USA
FOR THE DEVELOPMENT OF COOPERATION IN RESEARCH

The general objective of this Memorandum of Understanding (MOU) is to foster collaboration in research between the two departments. Thus, UNION CHRISTIAN COLLEGE and HOPE COLLEGE have agreed that in support of their mutual interests in scientific research that:

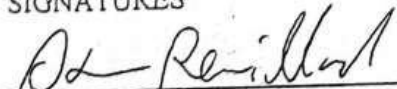
1. The two Departments will:

- a) cooperate in the exchange of information relating to their activities in research;
- b) promote appropriate joint research projects with particular emphasis on the use of the Hope Ion Beam Accelerator Laboratory;
- c) endeavor to encourage students and staff to spend time on these collaborative research projects;
- d) promote joint publications based on the results of the collaborative research.

2. The aim of the Memorandum of Understanding shall be to achieve a broad balance in the respective contributions and benefits of the collaboration, and this shall be subject to periodic review by both Physics Departments.


This agreement will take effect from the date of its signing and shall be valid for an unlimited period from that date unless sooner terminated, revoked, or modified by mutual written agreement between the two Parties, and may be extended by mutual written agreement. Either party may terminate the Agreement at any time during the term by the provision of three months written notice to the other party.

SIGNATURES

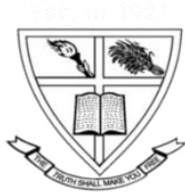

Stephen Remillard
for Hope College Physics Department

May 1, 2013

Date


Principal
Union Christian College (printed name)
For Union Christian College Physics Department

Date 01 - 05 - 2013



Department of Physics

MoU with HOPE College, USA

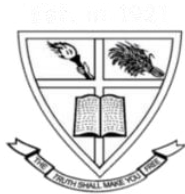
Report

The MoU was signed between the Department of Physics, Union Christian College, Aluva and the Department of Physics, Hope College, Michigan, USA for the development of cooperation in Research. Objectives are:

- 1) To promote joint research publications based on the results of collaborative research.
- 2) Cooperation in the exchange of information relating to activities in research.
- 3) To promote interaction of students and faculty for measurements and analysis.
- 4) To promote appropriate joint research proposals.

Activity

Faculties of both the Departments jointly published research papers.



CrystEngComm

PAPER



[View Article Online](#)
[View Journal](#) | [View Issue](#)



Cite this: *CrystEngComm*, 2019, 21, 128

Aluminium doping – a cost effective and super-fast method for low temperature crystallization of TiO₂ nanotubes

Sinitha B. Nair,^a Aijo John K.,^a Hilal Rahman,^a Julie Ann Joseph,^a Stephen K. Remillard^b and Rachel Reena Philip[✉]^a

Received 25th October 2018,
Accepted 12th November 2018

DOI: 10.1039/c8ce01834k

rsc.li/crystengcomm

In this paper, low-temperature crystallization of well aligned TiO₂ nanotubes within a record time of 20 seconds is reported. This new super-fast crystallization route with a tremendous technological impact due to its low energy budget and reproducibility involves the doping of TiO₂ nanotubes with aluminium at different temperatures from 2 °C to 60 °C by applying a negative voltage to amorphous nanotubes. The process offers formation of doped anatase TiO₂ nanotubes with a tuned band gap and improved conductivity.

1 Introduction

Titanium dioxide (TiO₂) nanotubes (TONTs) have been mostly investigated because of their outstanding performance in many photoelectrochemical applications including dye-sensitized solar cells, sensors, and supercapacitors and in photocatalysis and water splitting due to their abundance and non-toxicity.^{1–4} While TONTs with a narrow band gap and higher charge transfer efficiency are preferred for photocatalytic applications, a wider band gap and good electrical conductivity are suitable for their applications as electrodes in dye sensitized solar cells.⁵ Hence the tuning of their optical and electrochemical properties is of prime importance while considering their employability in various device fabrication processes. In addition, since amorphous TONTs are not suitable for the above said applications, production of crystalline tubes and control of the nanotube-array morphology are very much important for their application in dye-sensitized solar cells and photocatalysis.⁶ It is a major challenge to successfully convert the amorphous structure of as-fabricated TiO₂ nanotubes to crystalline, while maintaining the barrier layer at a minimal thickness. TONTs fabricated by an electrochemical anodization method are amorphous in nature and so an elevated temperature, typically greater than 450 °C, is required to induce crystallinity.^{7,8} But the main drawback of this method is that a very high thermal energy budget is needed to attain crystallization. Also this produces a thick barrier layer at the bottom of the nanotubes and it separates nanotube arrays from the substrate resulting in the slowdown of electrons which causes poor performance of devices.^{9,10}

Moreover, a high temperature annealing process is not favourable for the formation of nanotube arrays over temperature sensitive polymeric substrates.¹¹ Crystallization by hydrothermal treatment is not convenient as it results in structural damage.¹² Similarly, with sol-gel processes, TiO₂ nanoparticles usually exhibit a high tendency to aggregate.¹³ Therefore recently, researchers have investigated low-temperature methods for crystallization of TONTs to achieve the full benefit of the material properties.^{14,15}

In this decade, low-temperature water-assisted treatment to crystallize amorphous TiO₂ nanotubes has evoked enormous interest in the scientific community. It is reported that amorphous as-anodized TONTs are immersed in water for 3–4 days at room temperature or in hot water at a temperature near 90 °C for 20 hours to attain an anatase phase.^{16,17} These methods have the disadvantages of requiring very long incubation time and also the nanotubular structure getting damaged.^{18–20} Another method for crystallization of TONTs is by treating them with water vapour but in the crystallization process amorphous NTs are converted to nanorod-like structures.¹² Aijo *et al.*²¹ has reported room temperature crystallization by applying square pulses where crystallization begins to appear within the first five minutes of pulse treatment, leading to high crystallinity of tubes within 15 minutes. A few attempts to attain crystallization by doping TONTs with metal ions are also reported.^{22,23} Although the doped TONTs exhibit satisfactory properties, they usually suffer from multiple and tedious steps that limit their usage.^{24–28}

Here, we report successful conversion of amorphous TONTs to an anatase phase by a facile and novel method of doping the former with Al in an Al₂(SO₄)₃ electrolyte. This method has the multiple advantages of i) ultrafast conversion of amorphous TONTs to an anatase phase within a record time of 20 seconds without any structural or morphological

^a Department of Physics, Union Christian College, Aluva, Kerala, India.

E-mail: reenatara@gmail.com

^b Department of Physics, Hope College, Holland, MI49423, USA

Outcome of the activity

Collaborative research works are very much helpful in the attainment of the objectives such as cooperation in the exchange of information relating to activities in research and in promoting appropriate joint research proposals.



UANL

UNIVERSIDAD AUTÓNOMA DE NUEVO LEÓN



FACULTAD DE INGENIERÍA MECÁNICA Y ELÉCTRICA

MEMORANDUM OF UNDERSTANDING

Department of Physics, Union Christian College, Alüva and Facultad De Ingeniería Mecánica y Eléctrica, Universidad Autónoma De Nuevo León, Av. Pedro De Alba S/N, Cd. Universitaria, San Nicolás De Los Garza, Nuevo León 66455, México

FOR THE DEVELOPMENT OF COOPERATION IN RESEARCH

The general understanding of the memorandum of understanding is to foster collaboration in research between the two departments. The Department of Physics, Union Christian College and Facultad De Ingeniería Mecánica y Eléctrica, Universidad Autónoma De Nuevo León, Av. Pedro De Alba S/N, Cd. Universitaria, San Nicolás De Los Garza, Nuevo León 66455, México has agreed in support of their mutual interest in scientific research that :

1. The two departments will:

- Cooperate in the exchange of information relating to activities in research
- Promote interaction of students and faculty for measurements and analysis
- Promote appropriate joint research proposals
- Promote joint research publications based on the results of collaborative research.

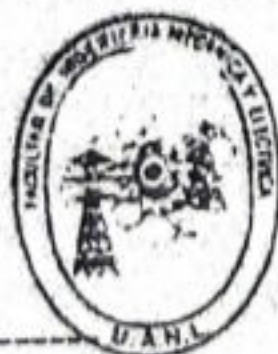
2. The aim of the Memorandum of understanding shall be to achieve a broad balance in the respective contributions and benefits of the collaboration and this shall be subjected to periodic review by both departments.

This agreement will take effect from the date of its signing and shall be valid for an unlimited period from that date unless sooner terminated revoked or modified by mutual written agreement between the two parties and may be extended by mutual written agreement. Either party may terminate the Agreement at any time during tile term by the provision of three months written notice to the other party.

Signatures

Name: --Dr. Sadasivan Shaji

Date: 16/Aug/2016...



PROGRAMA DOCTORAL
EN INGENIERIA DE MATERIALES

Signatures

Name: -Dr. Thomas Mathew

Date: 16/Aug/2016...

Principal
Union Christian College
ALUVA - 2

Pedro de Alba s/n, Ciudad Universitaria, C.P. 66451,
San Nicolás de los Garza, Nuevo León, México,
Conm.: 8329-4020, Fax: 8332-0904, www.fime.uanl.mx





Department of Physics

MoU with UANL, Mexico

Report

The MoU was signed between the Department of Physics, Union Christian College, Aluva and Facultad De Ingenieria Electrica, Universidad Autonoma De Nuevo Leon, Mexico for the development of cooperation in Research. Objectives are:

- 1) To promote joint research publications based on the results of collaborative research.
- 2) Cooperation in the exchange of information relating to activities in research.
- 3) To promote interaction of students and faculty for measurements and analysis.
- 4) To promote appropriate joint research proposals.

Activity

Faculties of both the Departments jointly published research papers.



Thin Solid Films 722 (2021) 138575



Contents lists available at ScienceDirect

Thin Solid Films

journal homepage: www.elsevier.com/locate/tsf



Room temperature ammonia sensing of α -MoO₃ nanorods grown on glass substrates

Tijin Thomas^a, Nagabandi Jayababu^c, Julakanti Shruthi^d, Alex Mathew^b,
Andrea Cerdán-Pasarán^a, Javier Alejandro Hernández-Magallanes^a, K.C. Sanal^{a,*}, Reshmi R.^{b,*}

^a Universidad Autónoma de Nuevo León, UANL, Facultad de Ciencias Químicas, Av. Universidad, Cd. Universitaria, 66455, San Nicolás de los Garza, Nuevo León, México

^b Optoelectronic and Nanomaterials Research Laboratory, Department of Physics, Union Christian College, Aluva, Kerala, 683102, India

^c Department of Electronic Engineering, Institute for Wearable Convergence Electronics, Kyung Hee University, 1732, Deogyeong-daero, Giheung-gu, Yongin 17104, Republic of Korea

^d Thin Films and Nano Materials Research Laboratory, Department of Physics, Osmania University, Hyderabad, Telangana State, 500007, India

ARTICLE INFO

Keywords:
Molybdenum trioxide nanorods
Vacuum thermal evaporation
Ammonia gas sensors

ABSTRACT

We report the fabrication of ammonia gas sensors operating at room temperature using aligned one-dimensional orthorhombic molybdenum trioxide (α -MoO₃) nanorods. α -MoO₃ nanorods were fabricated on glass substrates by thermal evaporation under vacuum condition and subsequent annealing at ambient air. The selectivity of fabricated sensors was performed with different test gases viz. ammonia, xylene, acetone, toluene, isopropanol, 2-methoxyethanol, n-butanol, methanol, and ethanol. Highest sensitivity for ammonia gas at room temperature (28 °C, 35% relative humidity) for a concentration of 100 ppm, was achieved. The sensors annealed at 400 °C showed response to lower concentrations of ammonia (1 ppm) with high repeatability. The sensing response dropped only less than 1% after one year of stable performance. The change in morphology and the structural modifications of α -MoO₃ nanorods with annealing had improved the sensing response.

1. Introduction

Ammonia (NH₃) gas is one of the commonly used coolants in chemical, automobile, textile, and fertilizer industries [1]. It also finds applications in the advanced selective catalytic reductive type automobile exhaust systems [2]. The leakage and miscarriage of ammonia gas cause serious environmental, and health problems for even lower concentrations. The proper monitoring of ammonia gas concentration is crucial for a healthy environment as 16–28% of its concentration in the atmosphere considered as fatal [3,4]. Hence, the development of efficient gas sensors capable of detecting NH₃ in lower concentration (<100 ppm) at room temperature has academic and industrial significance. The ammonia gas sensing were generally carried out using various methods including gas chromatography [5], optical spectroscopy [6], electrochemical method [7] and using semiconductors [8]. Among these, transition metal oxide semiconductor gas sensors were recognized more efficient and cheap compared to others because of their advanced sensing response towards various gases [9–11]. Sensors made of one dimensional (1-D) transition metal oxides are more efficient because of

their ease of fabrication, high stability, quick response, and recovery, compared to other existing sensors. Molybdenum trioxide [12], tungsten oxide [13], tin oxide [9], indium oxide [14] titanium dioxide [15], copper oxide [16], zinc oxide [3], and zinc oxide-nickel oxide [17] were identified as good candidates for the sensing application. Among these, a highly stable orthorhombic 1-D molybdenum trioxide (α -MoO₃) is known for its distinctive gas sensing performance due to its unique layered structure, the variable valence of molybdenum, and availability of plenty of active sites to trap targeted molecules during gas sensing [18].

Several groups have investigated the 1-D α -MoO₃ nanostructures for gas sensing applications [19,20]. L. Chen *et al.* [21] synthesized α -MoO₃ nanorods by ultrasonic synthesis and performed NO₂ gas sensing characterization at a working temperature of 290 °C and studied the effect of chlorination in sensing response. Yang *et al.* [22] synthesized α -MoO₃ nanoribbons by hydrothermal method for hydrogen sensing with higher concentrations (1000 ppm) at room temperature and reported a good response time of 14 s. Yang *et al.* [18] synthesized α -MoO₃ nanobelts by hydrothermal method for the sensing of the Tri-methyl Amine (TMA) at

* Corresponding authors.

E-mail addresses: sanal.kozhiparambilch@uanl.edu.mx (K.C. Sanal), rreshmi@gmail.com (R. R.).

<https://doi.org/10.1016/j.tsf.2021.138575>

Received 1 August 2020; Received in revised form 6 February 2021; Accepted 6 February 2021

Available online 9 February 2021

0040-6090/© 2021 Elsevier B.V. All rights reserved.

Outcome of the activity

Collaborative research works are very much helpful in the attainment of the objectives such as cooperation in the exchange of information relating to activities in research and in promoting appropriate joint research proposals.

December 2017

BELLARMINE UNIVERSITY

MEMORANDUM OF UNDERSTANDING

BETWEEN

Bellarmino University, 2001 Newburg Road, Louisville, KY 40213, USA

AND

Union Christian College, Aluva, Kerala 683522, India

BACKGROUND:

- A. Bellarmine University in Louisville, Kentucky, USA is an institution of higher learning accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACS-COC) to award baccalaureate, masters and doctoral degrees, and licensed to operate as an independent institution in Kentucky by the Kentucky Council on Post-Secondary Education (CPE). Members of the Bellarmine University community teach and research Indian religions and cultures within Interdisciplinary Core (IDC), and particularly through the work of Fr. John Pozhathuparambil. A group of students and other members of the university community travels to India every year under the sponsorship of Bellarmine University to learn about culture and religions.
- B. Union Christian College, an affiliated institution of Mahatma Gandhi University in Kottayam, India, conducts teaching and research on Indian Culture, Religions and Literature through Department of Malayalam.

PROGRAM DESCRIPTION:

This program is a cultural exchange between the two institutions, with students, faculty and staff traveling at mutually agreed upon times to visit the campus and community of the other to promote understanding and goodwill.

GOALS OF THIS COLLABORATIVE PROGRAM:

- To facilitate understanding of the culture and religions of each partner community;
- To develop relationships between the institutions' faculty, staff and students through shared experiences.

THE PARTIES ARE COMMITTED TO THE FOLLOWING PRINCIPLES:

- A. To welcome visiting students and staff and engage them to develop an appreciation of the culture and religions of the country in which they are visiting. This will be accomplished through scheduled class visits, seminars, student discussion and engagement, and other programs jointly agreed upon.
- B. Institutional visits can be one or two days in length.
- C. Each institution and representatives will be responsible for procuring their own visas and/or sponsorship letters.
- D. Students and staff are responsible for their own travel expenses.

Nothing in this Memorandum of Understanding constitutes any relationship of employer and employee, principal and agent, or partnership or trustee between the Parties. Further, the parties state that the relationships created by this MOU are not intended to be justiciable in any court. Neither Bellarmine University nor Union Christian College shall have any authority to bind the other in any manner whatsoever.

Cecilia C. Pfeffer
For Bellarmine University

9/6/17
Date

[Signature]
For Union Christian College

18/12/17
Date

Fr. John Pozhathuparambil
For Bellarmine University

9/7/17
Date

[Signature]
For Union Christian College

18/12/17
Date



MoU Between Bellarmine University, Kentucky, USA and Department of Malayalam, Union Christian College, Aluva

The MoU between Bellarmine University and department of Malayalam, Union Christian College was signed on 18/12/2017 with no restriction of time period. Bellarmine University is a private Catholic university in Louisville, Kentucky. It opened on October 3, 1950, as Bellarmine College, established by Archbishop John A. Floersch of the Archdiocese of Louisville and named after Saint Robert Bellarmine. In 2000, it became Bellarmine University. The MoU was signed with an objective of cultural exchange of two institutions with students, faculty and staff travelling at mutually agreed times to visit the campus and community to promote understanding and good will.

Report of the activity and Proof

Activity 1

Cultural exchange took place between department of Malayalam and Bellarmine University, USA. The students of Bellarmine University visited Union Christian College and various Cultural programs was conducted on 18th Dec 2018.

Activity 2

As Part of the Cultural Exchange Programme an eight-member team from the Bellarmine University visited the Department of Malayalam, U.C. College on 18-12-2019. Various cultural events were performed both by the visiting team and our students.

Proof is photographs of cultural program as well as that of the students of both institutions.



UNION CHRISTIAN COLLEGE, ALUVA

Affiliated to Mahatma Gandhi University, Kottayam, India

NAAC Re-Accredited with A Grade in 4th Cycle (CGPA 3.45)

www.uccollege.edu.in

SSR
5th CYCLE
2023





Outcome of the activities

Students of both Department of Malayalam and Bellarmine University benefitted from these academic visits from their mutual interaction and co-operation and the presentation of cultural activities.

Memorandum of Understanding Regarding Establishment and Running of PN Gopalakrishnan Pillai Memorial Endowment at the Department of Physics, Union Christian College, Aluva.

Purpose

1. The family of Late PN Gopalakrishnan Pillai of North, Paravur, intend to establish an Endowment in his name at the Department of Physics in Union Christian College (hereafter UC College or College) in Aluva. He had completed his B.Sc. Physics in 1948 and had worked as a Junior Lecturer in UC College for a couple of years. This Memorandum of Understanding (MoU) has been agreed between UC College, represented by the Manager of the College and the family of PNG Pillai, represented by his sons, Ajay Pillai and Vijay Pillai. The endowment to be called 'PN Gopalakrishnan Pillai Memorial Endowment' is intended to provide merit cum means scholarship to one M.Sc. Physics student each year and to help build up a library at the Department of Physics in UC College (as per details below).

The Endowment and Its Uses

2. The endowment will be established by a contribution being made by the family of PNG Pillai of an amount of Rs. 2 Lakhs. It will be held and managed by UC College as per existing practices for similar endowments that the College manages. The existing financial, fiduciary and audit arrangements of the College will apply to this endowment as well. The endowment amount will be held in interest earning bank accounts or other remunerative investments based on the College's decision and aligned with other endowments. The first payment from the Endowment is expected to be made in the academic year of 2018-19. The annual interest earned will be used as follows:
 - i. 40% of the amount to be given as scholarship every year. Currently, this amounts to Rs.6,800.
 - ii. 30% of the amount to be given to the Department of Physics with the intention of purchasing textbooks or, as appropriate, other digital resources for the library. Currently, this amounts to Rs.5,100.
 - iii. 30% of the amount to be ploughed back into the capital amount. Currently, this amounts to Rs. 5,100.
3. The identification of the recipient of the merit cum means scholarship will be made by the Department of Physics as per current practices of the College. Each year, one student from M.Sc Physics First Year will be the recipient of the scholarship. The selection of books for the library or getting access to online resources will also be made by the Department of Physics. The Department Library, both textbooks and online resources, will be well-managed as per good practices of the UC college general library. The Department of Physics could sometimes decide to roll over the interest earned for textbooks / online resources to the next year in order to allow sufficient money for the intended purposes. However, the scholarship amount will be used every year.

Communication and Future Changes

4. The physics department will send an annual communication to the sons of PNG Pillai endorsed by the principal which will contain the name of the scholarship recipient for the year as well as

the titles of the books / online resources purchased for the Library. The book cover pages will contain a line to the effect: 'Contributed by the PN Gopalakrishnan Memorial Endowment'. Information on the Endowment will also be included in all relevant College public reports along with other similar endowments, including the Annual Report.

5. Any changes to the use of the proceeds will be agreed by both parties. The contributors may wish to replenish the capital amount of the endowment at a future date.


Signed by the Manager:
On behalf of UC College


MANAGER
UNION CHRISTIAN COLLEGE
ALUVA - 683 102



Ajay Pillai and Vijay Pillai

Addresses & signatures


6117 Robinwood Road
Bethesda, MD 20817
USA
Email: coolpillai@gmail.com

Dated: 24 July 2017



Department of Physics

MoU regarding establishment and running of P.N. Gopalakrishnan Pillai Memorial Endowment

Report

The MoU was signed between the Department of Physics, Union Christian College, Aluva and the family of Late P.N. Gopalakrishnan Pillai intending to establish an Endowment in his name. Objective is to establish an endowment in the name of P.N. Gopalakrishnan Pillai in the Department of Physics and intended to provide merit cum means scholarship to one M.Sc. Physics student each year and to help build up a library in the Department.

Activity

1. Endowment





UNION CHRISTIAN COLLEGE, ALUVA

Affiliated to Mahatma Gandhi University, Kottayam, India

NAAC Re-Accredited with A Grade in 4th Cycle (CGPA 3.45)

www.uccollege.edu.in

SSR
5th CYCLE
2023

Aiswarya A.S. receiving P.N. Gopalakrishnan Pillai scholarship in the year 2021-22 from the Head of the Department Dr. Manu Punnen John

2. Purchased books to the Department library under this agreement.

REFERENCE BOOK SHOP
GSS SHOPPING COMPLEX
CONVENT ROAD, KOCHI - 682 035
E-mail: rbsekm@gmail.com
Ph: 9447510078 Mob: 9207030348

Page : 1

Customer: **THE PRINCIPAL, U.C COLLEGE,**
ALUVA - 683 102

Phone: 0484-2505164

CREDIT BILL

Invoice No: 491
Invoice Date: 13-Sep-23
Order No & Date:
No of Packages:
Paid Through:

Sl.No	Item Description	Author	Pub.	Qty	Cur	Rate	Amount	Disc%	Dis Amt	Net Value	
1	ELECTRICITY AND MAGNETISM	MURUGESHAN	S CHAND	3	R	390.00	1170.00	20.00	234.00	936.00	
2	INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY	POOLE	WILEY	1	R	889.00	889.00	20.00	177.80	711.20	
3	MATHEMATICAL PHYSICS WITH APPLICATIONS, PROBLEMS & SOLUTIONS	BALAKRISHNAN	ANE	2	R	1295.00	2590.00	20.00	518.00	2072.00	
6											
										Sub Total	4649.00
										Discount	929.80
										Freight	0.00
										Round Off	-0.20
										Net Amount :	3719.00

Rupees Three Thousand Seven Hundred and Nineteen Only

E. & O.E.

Terms & Conditions:-
Certified that latest edition have been supplied and that they are not reminder titles. Certified that the price charged in the invoice is correct and is according to Publishers catalogue.
The conversion rate quoted is the latest as decided by the Good Office Committee. All disputes are subjected to Ernakulam Jurisdiction only.

PRINTED BOOKS EXEMPTED FROM GST, HSN CODE: 4801

For REFERENCE BOOK SHOP
Authorised Signatory

REFERENCE BOOK SHOP
G.S.S. SHOPPING COMPLEX, CONVENT ROAD,
Near Public Library, Cochin - 35, Email Id :-rbsekm@gmail.com
Phone : ,,9447510078, 9207030348
TIN No. 32AIDPA0137HIZ4

INVOICE CREDIT

Invoice No. 1418
Invoice Date 03/08/2018
Order No.
Order Date / /

Name & Address Of Purchasing Dealer :
THE PRINCIPAL, U.C COLLEGE,
ALUVA.

Sl. No.	Particulars	Cur.	Qty	Rate	Gross Amount	Dis. %	Discount Amount	Net Value	
1	LEACH :DIGITAL PRINCIPLES AND APPLICATIONS	R	1	610.00	610.00	20.00	122.00	488.00	
2	BEISER :CONCEPTS OF MODERN PHYSICS 7TH ED	R	1	695.00	695.00	20.00	139.00	556.00	
3	GRIFFITHS :INTRODUCTION TO ELECTRODYNAMICS	R	1	469.00	469.00	20.00	93.80	375.20	
4	SUBRAMANYAM :A TEXT BOOK OF OPTICS	R	1	599.00	599.00	20.00	119.80	479.20	
5	GUPTA :UPKAR'S CSIR-UGC NET/JRF/SET : PHYSICAL SCIENCES PB	R	1	550.00	550.00	20.00	110.00	440.00	
6	SATYA PRAKASH : MATHEMATICAL PHYSICS : WITH CLASSICAL MECHANICS	R	1	745.00	745.00	20.00	149.00	596.00	
7	KRANE :INTRODUCTORY NUCLEAR PHYSICS	R	1	1495.00	1495.00	20.00	299.00	1196.00	
8	MAND :DIGITAL LOGIC AND COMPUTER DESIGN (PB)	R	1	749.00	749.00	20.00	149.80	599.20	
Total :				8	5912.00	1182.40		4729.60	
								Round Off	+0.40
								Grand Total	4730.00

Rupees Four Thousand Seven Hundred Thirty Only

Dollar : 72.10 Pound : 94.40 Euro : 83.90

E&OE
Certified that the rates at which the foreign currencies are converted in to Indian Rupees are as per the GOC in force as on the date of the invoices and if any excess found to be claimed later in the same will be adjusted in our subsequent bill or refunded by us. The prices charged in this bill are publisher's current price. Latest editions are supplied.
Books supplied in this bill are not remainder titles.

For REFERENCE BOOK SHOP
Authorised Signatory

Page No. : 1



UNION CHRISTIAN COLLEGE, ALUVA

Affiliated to Mahatma Gandhi University, Kottayam, India

NAAC Re-Accredited with A Grade in 4th Cycle (CGPA 3.45)

www.uccollege.edu.in

SSR
5th CYCLE
2023


UNION CHRISTIAN COLLEGE, ALUVA
(Affiliated to Mahatma Gandhi University, Kottayam)
Re-Accredited (4th Cycle) with 'A' Grade by the National Assessment and Accreditation Council (NAAC)

Certificate of Appreciation

Union Christian College takes pride in awarding this certificate
to ~~Mr~~/Ms SIMI P.A. of I Semester
~~B.A./B.Sc./B.Com./M.A./M.Sc.~~ PHYSICS who has secured
the P.N. Gopalakrishna Pillai Memorial Endowment
during the academic year 2018.. to 2019..




Prof. Dr. M. L. Punnoose
Principal
Union Christian College, Aluva-2
PRINCIPAL


UNION CHRISTIAN COLLEGE, ALUVA
(Affiliated to Mahatma Gandhi University, Kottayam)
Re-Accredited (4th Cycle) with 'A' Grade by the National Assessment and Accreditation Council (NAAC)

Certificate of Appreciation

Union Christian College takes pride in awarding this certificate
to ~~Mr~~/Ms AISWARYA A.S of I Semester
~~B.A./B.Sc./B.Com./M.A./M.Sc.~~ PHYSICS who has secured
the P.N. Gopalakrishna Pillai Memorial Endowment
during the academic year 2021.. to 2022..




Prof. Dr. M. L. Punnoose
Principal
Union Christian College, Aluva-2
PRINCIPAL



UNION CHRISTIAN COLLEGE, ALUVA

Affiliated to Mahatma Gandhi University, Kottayam, India

NAAC Re-Accredited with A Grade in 4th Cycle (CGPA 3.45)

www.uccollege.edu.in

SSR
5th CYCLE
2023



Outcome

This endowment is an encouragement to the PG students in the department. Collaborative research works are very much helpful in the attainment of the objectives such as cooperation in the exchange of information relating to activities in research and in promoting appropriate joint research proposals.

DEPARTMENT OF PHYSICS
COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY
KOCHI - 682 022, KERALA, INDIA



Dr. M. K. JAYARAJ

Professor

Hon. Director,
Centre of Excellence in Advanced Materials

11th September 2017

To

The Principal,
Union Christian College, Aluva.

Sub: MOU between Department of Physics, UC College and Centre of Excellence in Advanced Materials.

Sir,

I am very glad to sign the Memorandum of understanding between Department of Physics, UC College and Centre of Excellence in Advanced Materials, Cochin University of Science and Technology to further strengthen the research activities of between the two departments. Already we have joint collaborative project funded by Kerala State Council for Science, Technology Environment (KSCSTE) on "Growth of carbon nanotubes for transparent electronic application" with myself as the Principal Investigator and Dr. Reshmi from UC college as Co-PI. This collaboration is very productive and has resulted many joint publications. I am herewith attaching the memorandum understanding.

Thanking You

Yours Sincerely

Jayaraj.M.K

MEMORANDUM OF UNDERSTANDING
DEPARTMENT OF PHYSICS UNION CHRISTIAN COLLEGE,
ALUVA
AND CENTRE OF EXCELLENCE IN ADVANCED
MATERIALS, COCHIN UNIVERSITY OF SCIENCE AND
TECHNOLOGY.

FOR THE DEVELOPMENT OF COOPERATION IN RESEARCH

The general understanding of the memorandum of understanding is to foster collaboration in research between the two departments. The Department of Physics Union Christian College and Centre of Excellence in Advanced materials, Cochin University of Science and Technology has agreed that in support of their mutual interest in scientific research that:


1. The two departments will:

- a) Cooperate in the exchange of information relating to activities in research
- b) Promote interaction of students and faculty for measurements and analysis
- c) Promote appropriate joint research proposals
- d) Promote joint research publications based on the results of collaborative research.

2. The aim of the Memorandum of understanding shall be to achieve a broad balance in the respective contributions and benefits of the collaboration and this shall be subjected to periodic review by both departments.

This agreement will take effect from the date of its signing and shall be valid for an unlimited period from that date unless sooner terminated revoked or modified by mutual written agreement between the two parties and may be extended by mutual written agreement. Either party may terminate the Agreement at any time during the term by the provision of three months written notice to the other party.

Signatures



Prof. M.K. Jayaraj
Hon. Director
Centre for Advanced Materials
Cochin University of Science and Technology,
Kochi 22

Dr. RESHMI R
Assistant Professor
Dept of Physics
U C College, Aluva 2



Department of Physics

MoU with CUSAT

Report

The MoU was signed between the Department of Physics, Union Christian College, Aluva and Centre of Excellence in Advanced Materials, Cochin University of Science and Technology to foster collaboration in research. Objectives are:

- 1) To promote joint research publications based on the results of collaborative research.
- 2) Cooperation in the exchange of information relating to activities in research.
- 3) To promote interaction of students and faculty for measurements and analysis.
- 4) To promote appropriate joint research proposals.

Activity

Faculties in both the Departments jointly published research papers.



Materials Today: Proceedings 62 (2022) 5456–5459



Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr



Room temperature intrinsic ferromagnetism in pulsed laser ablated few layers of 2D-WS₂ on Si/SiO₂ substrates

Saranya Sasi^a, Midhun P.S.^b, Anju Joseph^c, Aneesh P.M.^c, M.K. Jayaraj^d, Reshmi R.^{a,*}

^a Optoelectronic and Nanomaterials Research Laboratory, Department of Physics, Union Christian College, Aluva, Kerala, 683102, India

^b Department of Physics, Cochin University of Science and Technology, Kerala, 682022, India

^c Department of Physics, Central University of Kerala, 671320, India

^d University of Calicut, Thengipalam, Kerala, 673635, India

ARTICLE INFO

Article history:

Available online 22 April 2022

Keywords:

Pulsed laser deposition (PLD)
Ferromagnetism
Spintronic devices

ABSTRACT

In this work we report the room temperature intrinsic ferromagnetism of pulsed laser deposited few layers of WS₂. The ablation was carried out by employing the fourth harmonics of Q-switched Nd-YAG laser (266 nm) at a temperature of 700 °C on Si/SiO₂ substrates. Few layers of WS₂ were confirmed by Raman and AFM measurements. The photoluminescence spectrum reveals the defect free nature of few layers of WS₂ and exhibits intense emission near the band gap. VSM measurements have explored the room temperature intrinsic ferromagnetism in a few layers of WS₂ thin films with a saturation magnetisation of 20.1 μemu. This is the first report of intrinsic ferromagnetism in PLD grown few layers of WS₂. The room temperature intrinsic ferromagnetic properties in a few layers of two dimensional WS₂ can be exploited to design atomically thin spintronic devices.

Copyright © 2022 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Emerging Trends in Material Science and Technology – 2022.

1. Introduction

Inspired by the discovery of graphene two dimensional (2D) transition metal dichalcogenides (TMDCs) received much interest in the field of material science [1,2]. These low dimensional materials with unique optical and electronic properties will be dominant in the upcoming generation of optoelectronic devices [3]. They exhibit X-M-X layered structure with a metal atomic layer sandwiched between the chalcogen layers [4,5]. This layered structure allows them to make a cross over from indirect band gap to direct band gap when they are scaled down from bulk to mono (few layers [6–8]). In the group of TMDCs WS₂ is a prominent member and the least investigated one compared to others. It possesses the highest carrier mobility due to its smallest effective electronic mass, strong thermal stability, more resistance to oxidation and larger spin–orbit coupling etc [9,10]. Some of the major application of WS₂ includes sensors [11], transistors [12], photovoltaics, hydrogen storage etc [13,14].

The optical and electrical properties of 2D materials are most investigated based on these applications. The magnetic features

of these layered materials remain unexplored to a great extent. The magnetic studies reveal the ferromagnetic behaviour of mono/few layer TMDCs rather than the diamagnetic character of the bulk TMDCs [15]. Tuning the magnetic properties in 2D layered materials can open up new perspectives in the future of spintronic and quantum information devices [16,17]. A ferromagnetic semiconductor allows the controlled generation and detection of spin currents, which facilitate the fabrication of low dimensional spintronic devices. There was many attempts performed to induce long-range ferromagnetism in 2D materials. Introduction of defects into the lattice, transition metal doping, applying tensile strain, modification in the edge structure and saturation rate etc are some of the methods to realize the ferromagnetic behaviour in these materials [18]. Lie et al [19] proposed the magnetic properties of MoS₂ nanoribbons with armchair and zigzag edges using first-principle calculations. Zhang et al examined the ferromagnetism in WS₂ nanoribbons with zigzag edges using the first principle calculation [20]. Most of the reported works on magnetic studies are restricted to the theoretical aspects of WS₂. There are reports on experimental studies on the magnetic characteristics of WS₂. Ding et al [21] reported the enhanced ferromagnetism induced by defects in WS₂. In another report room temperature ferromagnetism exhibited by high quality vanadium doped WS₂ monolayers

* Corresponding author.

E-mail address: reshmi@gmail.com (R. Reshmi).

<https://doi.org/10.1016/j.matpr.2022.04.120>

2214-7853/Copyright © 2022 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Emerging Trends in Material Science and Technology – 2022.



PAPER

RECEIVED
7 November 2020

REVISED
18 February 2021

ACCEPTED FOR PUBLICATION
26 February 2021

PUBLISHED
8 March 2021

Nano fibers of lead free perovskite Cesium Titanium Bromide (CsTiBr₃) thin films by in-house deposition technique

K A Benazeera Beegum¹, Saranya Sasi¹, Alex Mathew¹, A S Asha² and R Reshmi¹

¹ Optoelectronic and Nanomaterials Research Laboratory, Department of Physics, Union Christian College, Aluva, Kerala—683102, India

² Nano Materials for Emerging Solid State Technology Laboratory, Department of Physics, Cochin University of Science and Technology, Kochi, Kerala 682022, India

E-mail: rreshmi@gmail.com

Keywords: Cesium Titanium Bromide, two stage deposition, lead free, grain boundary grooving

Abstract

A novel lead free nano fibers of Cesium Titanium Bromide (CsTiBr₃) perovskite is synthesized on commercial glass substrate by a two stage deposition method for the first time. Cesium Bromide thin film prepared by vacuum evaporation by resistive heating is the substrate for deposition of Titanium Bromide (TiBr₄) vapor by an in-house deposition arrangement. The duration of deposition of TiBr₄ vapor on CsBr thin film plays a key role on the structural, compositional and morphological properties of CsTiBr₃. The mechanism behind the formation of nano fibers of CsTiBr₃ from polygonal grains of CsBr is discussed in detail. The grain boundary grooving of CsBr polygonal grains influences the evolution and dimension of CsTiBr₃ nano fibers. The nano fiber structure and lead free nature makes this novel perovskite a promising candidate for sensors, nanolasers and for future nanoelectronics.

1. Introduction

Organic-inorganic halide perovskites and all-inorganic halide perovskites have received attention in various applications like solar cells [1–5], light emitting diodes [6–11], field effect transistors [12, 13], photo detectors [14–17] and sensors [18–20]. The combined advantages of flexibility and low cost of the organic part and high mobility and thermal stability of inorganic part make the hybrid organic-inorganic perovskites (HOIP) as a good choice for the above applications. Methyl Ammonium Lead Halide (MAPbX₃) and Formamidinium Lead Halide (FAPbX₃) perovskites are the pioneers among these HOIPs due to their remarkable properties of long charge diffusion length, band gap tunability and ambipolar charge transport. The intrinsic thermal instability of these compounds attributed to their organic part is a limitation for the fabrication of MAPbX₃ and FAPbX₃ based electronic devices. The inorganic part of these compounds is toxic too [21–24]. All-inorganic metal trihalide perovskites, on the other hand, show more electronic and thermal stability than the organic-inorganic metal halide perovskites and are remarkable for optoelectronic applications [25–28]. The first synthesized perovskite was all-inorganic metal trihalide CsPdX₃ (X = Cl, Br, I) [29]. The frequency dependent photoconductivity of these compounds was demonstrated in 1950's. Among the various all-inorganic perovskites, Cesium Lead Halides CsPdX₃ and Cesium Tin Halides CsSnX₃ are the mostly studied. All-inorganic perovskites are good as active layers of solar cell, photo detectors, light emitting diodes and sensors. These compounds are also used as flexible printable devices [30–37].

The chemical and physical properties of perovskite materials depend on the dimensionality and morphology. Lower dimensional (2D and 1D) perovskites are superior to their three dimensional structure, being potential building blocks for photo detectors, nano-lasers, mini-solar cells, sensors and nano-electronics [38–40]. 2D MAPbI₃ synthesized by solution process and CsPbX₃ prepared by lower temperature synthesis were good in functioning as Light Emitting Diodes, Solar cells, Photo-field effect transistors, cold converters and wave-guides. 1D perovskites have high crystalline quality, longer carrier diffusion length, superior carrier transportation and high quantum-efficiency. The photo-electronic performance is found to be enhanced in 1D

Outcome of the activity

Collaborative research works are very much helpful in the attainment of the objectives such as cooperation in the exchange of information relating to activities in research and in promoting appropriate joint research proposals and publications.

भारतीय गैर न्यायिक

पचास
रुपये

रु.50



FIFTY
RUPEES

Rs.50

INDIA NON JUDICIAL

केरल KERALA

BV 469907

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING is entered into on this 5th day of June 2019 between:

The Kerala Cricket Association, a Society registered under the Travancore Cochin Literary Scientific and Charitable Societies Registration Act of 1955, represented by its Honorary Secretary, Adv. Sreejith V Nair, KCA Complex, Shastham Kovil Road, Thycaud, Thiruvananthapuram – 695014, hereinafter called the **FIRST PARTY** and Union Christian College, Aluva, represented by its Principal, Dr. David Saj Mathew, Union Christian College, Aluva herein after called the **SECOND PARTY**.

WHEREAS the First Party is running a project to impart residential training for college going girls through a program named Cricket Academies and Sports Hostels, Kerala (hereinafter referred to be as CASH Kerala), and wishes to house one academy under the aegis of the said CASH Kerala, namely the College Academy for Women, hereinafter referred to be as the **ACADEMY**, at UC College Aluva- 683 102, a facility owned by the Second party, hereinafter referred to as the **FACILITY**).



9808 34/5/19
Dr.
K. L. JAYAKUMAR
Municipal Court Stamp Vendor

Hon. Secretary
K. C. A. Thiruvananthapuram

Dr. David Saj Mathew
Principal/Drawing & Disbursing Officer
- U. C. College, Aluva



भारतीय गैर न्यायिक

पचास
रुपये

रु.50



FIFTY
RUPEES

Rs.50

INDIA NON JUDICIAL

കേരളം KERALA

BV 469908

This agreement witnessed as under:

1. Trainees of the academy shall be selected by the first party and they shall be admitted as students of the second party as per the rules and regulation of the M.G. University and College.
2. The academy shall function in accordance with the rules, regulations and norms framed by the First Party in consultation with the second party, from time to time.
3. The management and operation of the academies shall be performed by the first party directly or through its agents or officials.
4. The second party agrees to provide the sports facilities available in the college for the use of the trainees of the academy
5. The second part agrees to provide boarding and lodging as it thinks fit and reasonable for the trainees, women coaches (if necessary) under mutually agreed costs, terms and conditions as provided in Annexure 1 of this MoU.
6. The first party agrees not to cause any interruption to the normal functioning of the college/hostel.
7. The first party agrees and undertakes that the trainees and coaches in the academies shall abide with the rules of college/hostel discipline and security. The first party shall ensure the well being and discipline of trainees in the hostel.



9809
No. 3/15/19
KURSHITHA BEEGAM
Munsiff Court Stamp Vendor
Ernakulam

Hon. Secretary
K.C.A. Ernakulam

Dr. David San Mathew
Principal/Drawing & Disbursing Officer
U.C. College, Aluva

8. The second party shall allow the trainees of the academy who are admitted as students of the second party to use the Cricket Ground, practice wickets, Gymnasium and or other physical training equipment/facilities available with them free of cost without causing any hindrance to its use by its other students.
9. The first party agrees to provide necessary sports kit and sports clothing to trainees and coaches.
10. The first party shall nominate a coordinator whose name and contact details shall be kept informed to the second party.
11. The second party shall maintain proper attendance register of the trainees, a canteen register and a movement register marking time in and time out of trainees to and from the hostel and it shall be the responsibility of the coordinator nominated as above to verify and confirm the same fortnightly.
12. The second party shall submit the claim for reimbursement of expenses on a monthly basis systematically in accordance with the schedule of charges mentioned in Annexure 1 and first party shall release payment on approval of such claims. Such claims shall be credited within one month from submission of bill by the second party to the Bursar, U.C. College, Aluva
13. Both parties shall review the activities under this MoU at least on a quarterly basis at their level.
14. The first party reserves the right to windup CASH Kerala without assigning any reasons thereof. However the first party shall be responsible for meeting the entire expenses of the trainees who are already admitted for completing their studies in the college to the course they are admitted and also the hostel fees and expenses including mess fees, rent etc till the end of their course.
15. Both the parties to this MoU shall be at liberty to terminate this MoU with at least ninety clear days of advance notice without assigning any reasons thereof.
16. Without prejudice to the foregoing, steps shall be taken to ensure that the termination of this MoU will not compromise or discriminate against any of the activities or programs legally undertaken within the MoU frame work;
17. Any amendment(s) in this MoU shall be made with the consent of both the parties.
18. This MoU is valid for a period of 12 months from the date of signing.





Dr. David Saj Mathew. P.
Principal/Drawing & Disbursing Officer
U. C. College, Aluva

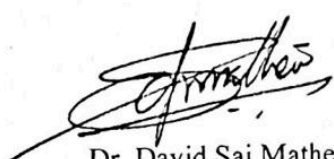
In witness thereof, the parties hereto have signed this MoU on 5th day of June, 2019.

For and on behalf of the Kerala Cricket Association

For and on behalf of the U.C. College, Aluva


Adv. Sreejith V. Nair
Honorary Secretary




Dr. David Saj Mathew
Dr. David Saj Mathew. P.
Principal/Drawing & Disbursing Officer
U. C. College, Aluva

Annexure 1

Schedule of Charges

Annual Boarding, Lodging, Housekeeping Fee (Rs.15, 255/-) and Canteen Expenses Rs. 200/- per day per trainee/per official.



Report of the MOU with The Kerala Cricket Association and Union Christian College, Aluva (Physical Education Department)

The MOU between Union Christian College, Department of Physical Education and Kerala Cricket Association was signed on 5/6/ 2019 for a period of 1 year.

Activity and Proof

As per the MoU, the activities include trainee selection, sharing sports facilities of the college to the students of the academy etc. Providing admission to outstanding women cricket players chosen by Kerala Cricket Association and providing food, boarding and lodging in college hostel along with the sports training facilities to promote cricket as a sport among young women. Such students have proved their mettle in certain interzone tournaments. So far 20 students have undergone training and have started representing college in various tournaments and have brought laurels to college, university and state

KERALA CRICKET ASSOCIATION

(MEMBER, BOARD OF CONTROL FOR CRICKET IN INDIA)



KCA COMPLEX, T.C. 24/131(1)
SASTHAMKOVIL ROAD, THYCAUD
THIRUVANANTHAPURAM - 695 014

TELE & FAX : 0471 2326522
E-MAIL : keralacricketone@gmail.com
WEBSITE : www.keralacricketassociation.com

01-08-2017

The Principal
Union Christian College
Aluva

Respected Sir,

At the outset Kerala Cricket Association take this opportunity to thank you and the college management for permitting us to start a women cricket academy and also for admitting five of our girls in the college and hostel. We are sure that this gesture will definitely bring a transformation in the women cricket scenario. We hope that the effort put in by you and KCA will bring out positive results in the performance of the girls.

With regard to the expenses regarding the five players studying and staying there, we understand that the payments are to be made in three installments as under

Item	Amount per installment
Room rent	970.00
Committee fee	90.00
Establishment fee	5430.00
Total	4490.00
Food charges per day per player	200.00

We request you to kindly raise an invoice along with your bank details every four months so that we can transfer the amount to your bank account.

Looking forward to a long standing relationship

With warm regards

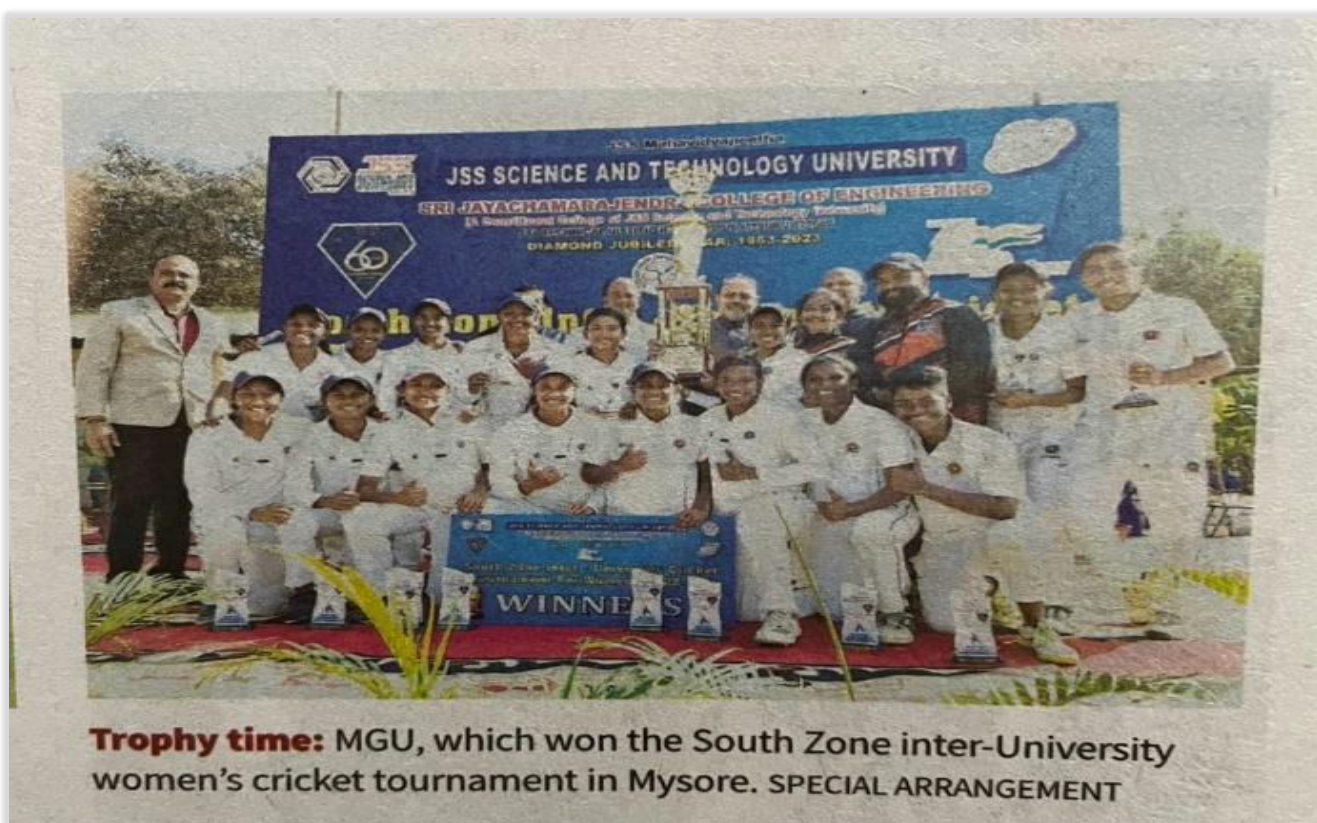

Ronjit Thomas
General Manager





KERALA CRICKET ASSOCIATION CRICKET ACADEMIES & SPORTS HOSTEL, KERALA KCA WOMENS COLLEGE ACADEMY (2018 - 19)									
Zone: Central			District: Ernakulam			Place: Aluva, EKM		Category: Senior Girls	
Academy: KCA Womens College Academy, EKM			College: U C College, Aluva			Year: 2018 - 19			
Sl No	Name	College	Class (2018 - 19)	D.O.B	Course	Home District	Skill Proficiency	Date of Joining (KCA Academy)	Contact No
A. Following Players of KCA Womens College Academy, Aluva Ernakulam are selected / retained to continue for the year 2018 - 19.									
1	Joshina P M	U C College, Aluva	2nd Year	20.01.2000		Kozhikode	RAMP / RHMOB	06.02.2013	9539906473
2	Maneesha C K	U C College, Aluva	2nd Year	20.08.1999		Kozhikode	WK / RHMOB	06.02.2013	9539252172
3	Darsana Mohanan	U C College, Aluva	2nd Year	30/12/1999		Wayanad	RAOS / RHTOB	06/02/2013	952449380
4	Anjana N R	U C College, Aluva	2nd Year	18.11.1997		Thrissur	RAMP / RHMOB		9556562771
5	Elizabeth Abraham	U C College, Aluva	3rd Year	13.07.1988		Ernakulam	RHTOB		9961871553
Following KCA Zonal Academy players are selected to join the KCA Womens College Academy, Aluva (EKM) for the year 2018 - 19.									
1	Ansu Sunil	North Zonal Girls CA, WYND	Degree 1st Yr	23.11.2020		Pathanamthitta	RHTOB	01.06.2014	6262337398
1	Aleena Surendran	North Zonal Girls CA, WYND	Degree 1st Yr	29.11.2000		Idukki	LHTOB / RAMP	01.06.2014	7559875939
1	Sandra Suran	North Zonal Girls CA, WYND	Degree 1st Yr	20.09.1999		Pathanamthitta	RHMOB / RAOS	05.06.2013	9526940019
1	Sourabhya P	North Zonal Girls CA, WYND	Degree 1st Yr	21.04.2001		Kannur	RAMP / RHMOB	01.06.2013	9544385596
1	Sayoojya K S	North Zonal Girls CA, WYND	Degree 1st Yr	28.06.2001		Thrissur	RHTOB	01.06.2016	8921766364
Details of Coaching / Supporting Staff									
Name	Designation	Sex	Date of Birth	Level of Coaching	Home District	E - Mail	Date of Joining (KCA)	Contact No	
Umesh N K	Coach	M	31.05.1982	A	Ernakulam	umesh.nk1@gmail.com	01.05.2009	9745201658	
Summary									
No of College Academy trainees continuing next year									5
No of Zonal Academy trainees selected to KCA College Academy at U C College, Aluva (EKM)									5
No of trainees who are weeded out									0
No of trainees who are leaving after successful completion of course / time at the Academy									0
Total Strength (Present)									10







KERALA CRICKET ASSOCIATION

(MEMBER, BOARD OF CONTROL FOR CRICKET IN INDIA)

2189



CERTIFICATE

This is to certify that **Sourabhya P**

of **Cannanore** District has represented

Kerala State Under 19 Women's team which participated in the

T/20 Inter-State League & Super League Tournament

Conducted by the Board of Control for Cricket in India

held at **Amtar, Dharamshala & Guntur**

during the Season **2018-19 (14-10-2018 to 01/11/2018)**

His/Her Date of Birth is **21/04/2001**

Place : Trivandrum

Date : **04-04-2019**



HONORARY SECRETARY
KERALA CRICKET ASSOCIATION



KERALA CRICKET ASSOCIATION
(MEMBER, BOARD OF CONTROL FOR CRICKET IN INDIA)

2266



CERTIFICATE

This is to certify that **Sourabhya P**
of **Cannanore** District has represented
Kerala State Under 23 Women's team which participated in the
One Day, Inter-State Tournament
Conducted by the Board of Control for Cricket in India
held at **Surat**
during the Season **2018-19 (18-03-2019 to 05-04-2019)**
His /Her Date of Birth is **21/04/2001**

Place : Trivandrum
Date : **08-04-2019**



HONORARY SECRETARY
KERALA CRICKET ASSOCIATION



Outcome of the activity

Academy nominated 20 students have undergone training and have started representing college, district and state tournaments.



ഫോൺ: 0484-2478032

കുന്നുകര ഗ്രാമപഞ്ചായത്ത് കാര്യാലയം

(An ISO-9001-2008 Certified Institution)

കുന്നുകര- 683 578, എറണാകുളം ജില്ല

e-mail:kunnukara@gmail.com

കുറ്റിപ്പുഴ കൃഷ്ണപ്പിള്ള സ്മാരക സാംസ്കാരിക പഠന കേന്ദ്രം

കുന്നുകര പഞ്ചായത്തും ആലുവ യു.സി.കോളേജിലെ മലയാളവിഭാഗവും
സംയുക്തമായി ഉണ്ടാക്കിയ ധാരണാപത്രം

പരിപാടിയുടെ ചുരുക്കം

യു.സി.കോളേജിലെ മലയാളവിഭാഗത്തിൽ പ്രവർത്തിക്കുന്ന കുറ്റിപ്പുഴ കൃഷ്ണപ്പിള്ള സ്മാരക പഠനപീഠം കുന്നുകരപഞ്ചായത്തിലെ സാംസ്കാരിക പരിപാടിയിൽ സാഹിത്യവും സാംസ്കാരിക രൂപങ്ങളും ആയി ബന്ധപ്പെട്ട പ്രവർത്തനങ്ങൾ ഏറ്റെടുത്ത് നടത്തുന്നതാണ്.

ലക്ഷ്യങ്ങൾ

ആലുവ യു.സി.കോളേജിലെ മലയാളവിഭാഗം അധ്യാപകരുടെയും പൂർവ്വവിദ്യാർത്ഥികളുടെയും അക്കാദമികവും സാംസ്കാരികവുമായ അനുഭവങ്ങളും ജ്ഞാനങ്ങളും ഗ്രാമീണമേഖലയിൽ എത്തിക്കുകവഴി വിദ്യാഭ്യാസത്തിന്റെ സാമൂഹികപ്രയോജനം സാധിക്കുന്നു.

വിദ്യാഭ്യാസപരവും സാംസ്കാരികവുമായ പരിപാടികളുമായി ബന്ധപ്പെട്ട് പഞ്ചായത്ത് വകുപ്പുകളിലൂടെ നീക്കിവെച്ചിരിക്കുന്ന മൂലധനത്തെ ഫലപ്രദമായി വിനിയോഗിക്കാൻ കഴിയുന്നു.

വ്യവസ്ഥകൾ

1. കുന്നുകരപഞ്ചായത്തിൽ രൂപീകരിച്ചിട്ടുള്ള കുറ്റിപ്പുഴ കൃഷ്ണപ്പിള്ളസ്മാരക സാംസ്കാരികപഠനകേന്ദ്രം ഭാഷാസാഹിത്യമത്സരങ്ങൾ സംഘടിപ്പിക്കുമ്പോൾ രചനകൾ വിലയിരുത്തി ഫലങ്ങൾ തിരുകാനിരിക്കുന്ന പ്രക്രിയയിൽ ആവശ്യമായ വിധികർത്താക്കളെ നിശ്ചയിച്ച് ഫലപ്രഖ്യാപനം നടത്തുന്നതുവരെയുള്ള ഉത്തരവാദിത്തം യു.സി.കോളേജ് മലയാളവിഭാഗത്തിലെ കുറ്റിപ്പുഴ കൃഷ്ണപ്പിള്ളസ്മാരക പഠനപീഠത്തിനായിരിക്കും.

2. മത്സര ഇനങ്ങൾ, വിഷയങ്ങൾ എന്നിവ നിശ്ചയിക്കുന്നത് യു.സി.കോളേജ് മലയാളവിഭാഗവും പഞ്ചായത്തും സംയുക്തമായിട്ടായിരിക്കും. കുന്നുകരപഞ്ചായത്ത് കുറ്റിപ്പുഴ കൃഷ്ണപ്പിള്ള സ്ഥാനകേന്ദ്രത്തിന്റെ എക്സിക്യൂട്ടീവ് കമ്മിറ്റിയാണ് ഇത്തരം വിഷയങ്ങളിൽ സഹകരിക്കേണ്ടത്.
3. കുറ്റിപ്പുഴ കൃഷ്ണപ്പിള്ള സ്ഥാനകേന്ദ്രം അവാർഡ് ഓരോ തവണയും ക്ഷണിക്കുന്നത് പഞ്ചായത്തും മലയാളവിഭാഗവും സംയുക്തമായിട്ടായിരിക്കും. അവാർഡിനു പരിഗണിക്കേണ്ട കൃതികൾ എത്തിക്കേണ്ട-വിഭാഗം ആലുവ യു.സി.കോളേജ് മലയാളവിഭാഗം ആയിരിക്കും.
4. അവാർഡ് നിർണയത്തിന്റെ ചുമതലകൾ പ്രാഥമികവിലയിരുത്തൽ, വിധികർത്താക്കളെ നിശ്ചയിക്കൽ, ഫലസംയോജനം, അവാർഡ് നിർണയം എന്നിവ മലയാളവിഭാഗം നിർവ്വഹിക്കുന്നതാണ്. ഇതുമായി ബന്ധപ്പെട്ട എല്ലാവിവരങ്ങളും അതതുസമയത്ത് എക്സിക്യൂട്ടീവ് സമിതിയെ അറിയിക്കേണ്ടതും കമ്മിറ്റിയുടെ നിർദ്ദേശങ്ങൾ സ്വീകരിക്കേണ്ടതുമാണ്. അവാർഡിനുള്ള വിധികർത്താക്കളുടെ പേര് അവാർഡ് നിർണയം പൂർത്തിയാകുന്നവരെ രഹസ്യമായി സൂക്ഷിക്കണമെന്നതിനാൽ ആയത് കമ്മിറ്റിയിൽ വെളിപ്പെടുത്തേണ്ടതില്ല.
5. അവാർഡ് തുക, ഫലകം, സാക്ഷ്യപത്രം, സാഹിത്യമത്സരങ്ങൾക്കുള്ള പാരിതോഷികങ്ങൾ, അനുസ്മരണപ്രഭാഷണ നടത്തിപ്പ് എന്നിങ്ങനെ പഠനകേന്ദ്രത്തിന്റെ നടത്തിപ്പിന് ആവശ്യമായി വരുന്ന സാമ്പത്തിക ചെലവ് പഞ്ചായത്ത് നിർവ്വഹിക്കേണ്ടതാണ്.
6. കുറ്റിപ്പുഴ കൃഷ്ണപ്പിള്ള സ്ഥാനകേന്ദ്രപ്രഭാഷണങ്ങൾ പ്രതിവർഷം ഒരേയ്ക്കുമെങ്കിലും നടത്തേണ്ടതാണ്. വിഷയസ്വീകാരം, പ്രഭാഷകർ എന്നികാര്യങ്ങൾ എക്സിക്യൂട്ടീവ് കമ്മിറ്റി തീരുമാനിക്കേണ്ടതാണ്.
7. നിർദ്ദിഷ്ട പരിപാടികൾക്കു പുറമെ എന്തെങ്കിലും പ്രത്യേക പരിപാടികൾ വേണമെങ്കിൽ എക്സിക്യൂട്ടീവ് കമ്മിറ്റിക്ക് തീരുമാനിക്കാവുന്നതാണ്.
8. ധാരണാപത്രത്തെ അടിസ്ഥാനപ്പെടുത്തിയുള്ള വ്യവഹാരങ്ങളെ സംബന്ധിച്ച് യാതൊരു വിധത്തിലുമുള്ള നിയമനടപടികൾ, കോടതിവ്യവഹാരം എന്നിവയ്ക്ക് യു.സി.കോളേജ് മലയാളവിഭാഗത്തിനോ കുന്നുകരപഞ്ചായത്തിനോ അവകാശമുണ്ടായിരിക്കുന്നതല്ല.

1. കുന്നുകര ഗ്രാമപഞ്ചായത്തിനുവേണ്ടി

പ്രമാൻസിസ് തറയിൽ

പ്രസിഡന്റ്

2. ആലുവ യു.സി.കോളേജിനുവേണ്ടി

ഡോ. തോമസ് മാത്യു

പ്രിൻസിപ്പാൾ

3. കുന്നുകര ഗ്രാമപഞ്ചായത്തിനുവേണ്ടി

സീന സന്തോഷ്

വൈസ് പ്രസിഡന്റ്

4. ആലുവ യു.സി.കോളേജിനുവേണ്ടി

ഡോ. മ്യൂസ് മേരി ജോർജ്ജ്

മലയാള വിഭാഗം മേധാവി





MoU Between Kunnukara Panchayat and Union Christian College (Malayalam Department)

MOU between Kunnukara Panchayat and Union Christian college (Malayalam Department) is signed on 22/03/2018 with no restriction of time period and an objective of disseminating knowledge and cultural understanding of students and faculty of the department among the rural population of Kunnukara Panchayat, thereby meeting the larger goal of education as a social good. This MOU is signed in the honour of Kuttipusha Krishna Pilla, a well acclaimed Professor of department of Malayalam. The activities under this MOU involves, essay or paper writing competitions and best paper to be given the Kuttipusha Krishna Pilla award. It also includes other activities like joint exhibitions and library visits.

Report of the activity and proof

Activity 1

Inauguration of Kuttipuzha krishnapilla smaraka library and research centre by faculty of department of Malayalam. Brochure and photo of the inauguration is presented as proof.







Activity 2

The Department of Malayalam in association with Kunnukara Panchayath, and Sashtra Sahitya Parishath conducted an Eco friendly products exhibition 'Koodu Bhoomikkai Nalekkai' on 17th February 2021. Shri. Asha Menon famous writer and reviewer inaugurated the exhibition. Students from nearby schools visited the exhibition.



Outcome of the Programs

Students were active participants in these cultural programs and they gained knowledge, displayed creativity as well as organisational skills in doing these programs.

കേരളം കേരള KERALA

F 879323

DEED OF AGREEMENT

THIS DEED OF AGREEMENT executed on this Twelfth day of March, 2019 between PAUL K. MATHEW, aged 47 years, S/o. K.P. Mathew, Kulangara Thekke Puthenveedu, Convent Road, North Paravur P.O., Paravur Village, Paravur Taluk, Ernakulam District- 683513 (hereinafter called "the First Party") of the one part AND Union Christian College, Aluva, (hereinafter called "the Second Party") represented by its Principal, Dr. Thara K Simon, aged 53 years, W/o. Jacob Elias, U.C. College P.O, Aluva, of the other part.

Whereas the first party, the absolute owner in possession of the entire items mentioned in the scheduled list here to the annex, is desirous to donate his entire items in the list by way of gift in favour of the second party. The deed of gift witness as follows

1. The items received from the first party will be kept as a single collection.



P1

Dr. THARA K. SIMON
Principal
Union Christian College
Aluva-2



നമ്പർ... 6436 തീയതി... 11/3/19...
The Principal Union Christian College
Aluva- 683102

രമണി വി.കെ.
സാമ്പ് വെണ്ടർ. അലുവ

2. The collection of items received from the first party will be named as Paul Mathew Kulangara Gallery and has to be displayed by the second party in the U C College museum.

The original deed shall be kept in the custody of the first party and the photocopy of the same shall be taken by the second party.

In witness whereof the First Party and Second Party have put their respective hands on this on the date month and year first above written.

First Party : PAUL K. MATHEW

Second Party : Dr. THARA K. SIMON

Witness :

1. Seena M. Mathai
2. Jense Peter

First Party : PAUL K. MATHEW

Second Party : Dr. THARA K. SIMON

List of objects in Kulangara Collection, Paul Mathew Kulangara Gallery, Union Christian College, Aluva

Sl. No	Name of Object	Quantity	Remarks
1.	Gramophone	01	Gift
2.	Small gramophone discs	09	Gift
3.	Big gramophone discs	22	Gift
4.	Kindi	1	Gift
5.	Lamp	1	Gift

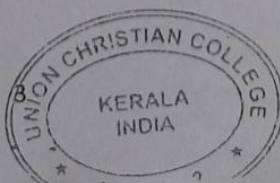


Dr. THARA K. SIMON
Principal
Union Christian College
Aluva-2

6.	Oar of a boat	1	Gift
7.	Glass bottle	1	Gift Green with stopper
8.	Butter churning pot with lid	1	Gift
9.	Chain with rod	1	Gift, Broken
10.	Oval ceramic plate white	1	Gift, Made in London
11.	Bengal Potteries ceramic plate	1	Gift
12.	Glass tumbler and glass set	1	Gift
13.	Parker Ink pot	1	Gift
14.	Century calculator disc	1	Gift
15.	Small Portable scale with wooden case	1	Gift
16.	Palm leaf grantha	1	Gift
17.	Rasipalaka	1	Gift
18.	Wall hanging wooden	1	Gift
19.	Palm leaves from Chottanikara	1	Gift, Loose 56 leaves
20.	Stamps in one collection	374	Gift
21.	Stamp in an album	768	Gift
22.	Victory Stamp Album 1937 pre- World War	1	Countries that do not exist today are printed on each page
23.	Elephant tooth	1	Gift
24.	Leather handmade bag	1	Gift
25.	Blue container with wooden lid	1	Gift
26.	Tea pot	1	Gift
27.	Coconut shell spoon	1	Gift
28.	Bottle with olive oil from London made in 1918	1	Gift
29.	Textile items used ceremonially by men during functions	2	Gift
30.	Inkpot open type	1	Gift
31.	Small carved brass dish	1	Gift
32.	Paper made Victory seal	1	Gift
33.	Blue on white milk kettle	1	Gift
34.	Wooden case for medicines	1	Gift

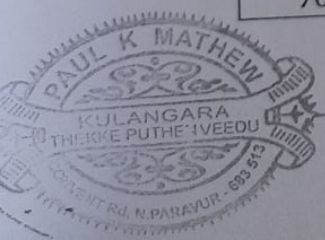


21



Dr. THARA K. SIMON
Principal
Union Christian College
Aluva-2

35.	Tray made of silver and glass	1	Gift
36.	Champagne bottle	1	Gift
37.	Ceramic plate made in Holland	1	Gift
38.	Ceramic by Adam and Co England	1	Gift
39.	Ceramic plate by Kerala Potteries	1	Gift
40.	Peacock blue wine bottle 20 ounce	1	Gift
41.	Peacock blue wine bottle 10 ounce	1	Gift
42.	Peacock blue wine bottle 5 ounce	1	Gift
43.	Dark blue on white small pot	1	Gift
44.	Wooden box	1	Gift
45.	Colander and tiffin carrier Aluminum	1	Gift
46.	Glass lamp	1	Gift
47.	Square ink pot	1	Gift
48.	Vettila Box brass small	1	Gift
49.	Vettila Box brass medium	1	Gift
50.	Poothalika	1	Gift
51.	Menthol cone	1	Gift
52.	Cigar case wood	1	Gift
53.	Painted wooden case	1	Gift
54.	Cup with stand	1	Gift
55.	A wooden chest with cufflinks, keys and buttons	1	Gift
56.	Petromax lamp part	1	Gift
57.	Crochet set plastic	1	Gift
58.	Chinese ceramic pot with broken lid	1	Gift
59.	Wooden model elephants	2	Gift
60.	Sieve with handle	1	Gift
61.	Wooden chest	1	Gift
62.	Umikarikotta hanging type made of a single piece of wood	1	Gift
63.	Murphy radio	1	Gift
64.	Ceramic swan	1	Gift
65.	Czechoslovakian violin	1	Gift
66.	Blue tin with sieve inside	1	Gift
67.	Manicheppu	1	Gift
68.	Perfume glass bottle	1	Gift
69.	Small brass chest	1	Gift
70.	Brass arathi lamp	1	Gift

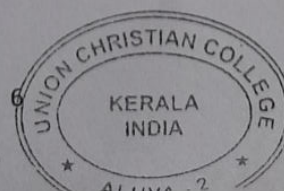


21



Dr. THARAK K. SIMON
Principal
Union Christian College

110.	Vedapusthaka Nighantu 1937	1	Gift
111.	Christian Directory 1910	1	Gift
112.	Kerala Directory 1966	1	Gift
113.	Madras State Directory 1929	1	Gift
114.	1930 Book	1	Gift
115.	New Testament in Tamil 1860	1	Gift
116.	Book by K K Kuruvila --	1	Gift
117.	Swamikal 1962	1	Gift
118.	Letter from G Sankara kurup 1961	1	Gift
119.	Bible in Sanskrit sloka	1	Gift
120.	Photos in albums	3 albu ms 621 photo s	Gift
121.	Telegram 1964	3	Gift
122.	Vellikol	1	Gift
123.	Montha	1	Gift
124.	Chellam	1	Gift
125.	Idangazhi	1	Gift
126.	Thalika	1	Gift
127.	Kuzhal Pathram	1	Gift
128.	Survey maps published in 1956	30	Gift
129.	Egg beater iron	1	Gift
130.	St George statue	1	Gift
131.	Ceramic plates	7	Gift
132.	Iron casserole green	1	Gift
133.	Iron kettle brown	1	Gift
134.	Water jar	1	Gift
135.	Iron spoon	1	Gift
136.	Glass kitchen utensil	1	Gift
137.	Ceramic incense burner	1	Gift
138.	Seal	1	Gift
139.	Horn of an animal	1	Gift
140.	Parrot made of wood	1	Gift
141.	Gramophone discs	1	Gift
142.	Knife	1	Gift
143.	Old type of keys	1	Gift
144.	Dishes metal	3	Gift



Dr. THARA K. SIMON
Principal
Union Christian College
Aluva-2

145.	Roof tiles 1865 Basel mission patent	2	Gift
146.	Adakkavetti/ Pakkuvetti metal	1	Gift
147.	Pen knife	1	Gift
148.	Old lemon squeezer glass	1	Gift
149.	Horn of an animal	1	Gift
150.	Bharani	1	Gift
151.	Rasi coins	30	Gift
152.	Coins	191	Gift
153.	Adharam Original	1	Gift
154.	Adharam photocopies	2	Gift
155.	Document related to church in English and Syriac photocopies whose originals are kept in Parur Marthoma church	3	Gift
156.	Original Document of land	1	Gift
157.	Original document of the boat	1	Gift
158.	Silver plates	2	Gift
159.	Silver spoons	14	Gift
160.	Box Rosewood	1	Gift
161.	Silver plate	2	Gift
162.	Silver photo frame	2	Gift
163.	Small kindi with lid brass	1	Gift
164.	Cigarette case wood	1	Gift
165.	Silver spoon large	1	Gift
166.	Small wooden box	1	Gift
167.	Laminated photo of the Paravur Synagogue	1	Gift



Dr. THARA K. SIMON
Principal
Union Christian College
Aluva-2



UANL

UNIVERSIDAD AUTÓNOMA DE NUEVO LEÓN ☐ FACULTAD DE CIENCIAS QUÍMICAS / Subdirección Académica de Ingeniería Química y Ambiental



01/08/2019

CARTA DE COLABORACIÓN ACADÉMICA

ENTRE:

DOCTORADO EN CIENCIAS CON ORIENTACIÓN EN PROCESOS SUSTENTABLES,
FACULTAD DE CIENCIAS QUÍMICAS-UANL, RECONOCIDO COMO PROGRAMA DE
COMPETENCIA INTERNACIONAL POR EL PROGRAMA NACIONAL DE CALIDAD
(PNPC) DEL CONACYT

Y

DEPARTAMENTO DE FÍSICA DEL INSTITUTO DE UNION CHRIST COLLEGE DE LA
UNIVERSIDAD DE MAHATMA GANDHI, INDIA.

Dr. **SANAL KOZHIPARAMBIL CHANDRAN** del Programa Doctorado en Ciencias con orientación en Procesos Sustentables de la Facultad de Ciencias Químicas-UANL, y el investigador **Dra. RESHMI RAMAN**, del Departamento de física de Instituto del Union Christian College del Universidad de Mahatma Gandhi, India, han acordado suscribir la presente carta de colaboración académica que tiene como objetivo la participación de una o más de las siguientes actividades:

- 1.- Intercambio de profesores
- 2.- Intercambio de estudiantes
- 3.- Movilidad de estudiantes
- 4.- Publicaciones conjuntas (si son derivadas de tesis, el primer autor es el estudiante y el autor correspondiente es el investigador que dirige la tesis en la institución de adscripción)
- 5.- Seminarios conjuntos de alumnos
- 6.- Co-autorías o Asesorías

Se firma la presenta carta de colaboración el día uno del mes de agosto del 2019

Dr. SANAL KOZHIPARAMBIL CHANDRAN

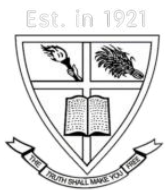
Facultad de Ciencias Químicas
Universidad Autónoma de Nuevo León

Dra. RESHMI RAMAN

Departamento de física de Instituto del Union Christian College
Universidad de Mahatma Gandhi, India



Av. Universidad s/n, Cd. Universitaria, C.P. 66455
San Nicolás de los Garza, N.L.
Tel. 83 29 40 00 Ext. 6349, 6281
e-mail: monica.alcalá@uanl.edu.mx



Department of Physics MoU with UANL, Mexico Report

The MoU was signed between the Department of Physics, Union Christian College, Aluva and Facultad De Ingenieria Electrica, Universidad Autonoma De Nuevo Leon, Mexico for the development of cooperation in Research. Objectives are:

- 1) To promote joint research publications based on the results of collaborative research.
- 2) Cooperation in the exchange of information relating to activities in research.
- 3) To promote interaction of students and faculty for measurements and analysis.
- 4) To promote appropriate joint research proposals.

Activity

Faculties of both the Departments jointly published research papers.



Applied Physics A (2022) 128:1089
<https://doi.org/10.1007/s00339-022-06246-w>

Applied Physics A
Materials Science & Processing



Band gap engineering of TiO₂ by Mn doping and the effect of p-TNT: Mn/n-MnO₂ heterojunction on photocatalytic applications

Priya S. Nair^{1,2} · Hiba Rahman¹ · Julie Ann Joseph¹ · Aleena Norbert¹ · Sadasivan Shaji³ · S. Tripathi^{4,5} · S. N. Jha^{4,5} · Rachel Reena Philip¹

Received: 7 September 2022 / Accepted: 11 November 2022
© The Author(s), under exclusive licence to Springer-Verlag GmbH, DE part of Springer Nature 2022

Abstract

The present study reports the achievement of improved photocatalytic performance of Titanium dioxide nanotubes (TNTs) by manganese doping and the subsequent formation of a p-TNT: Mn/n-MnO₂ heterojunction. The nanotubes and junctions are prepared by simple and cost-effective electrochemical anodization and doping techniques. The influence of doping and junction formation on the structural, optical, morphological and electrical properties of TNTs are analysed in detail. Energy dispersive x-ray mapping together with X-ray photoelectron spectroscopy is used to confirm the composition of the samples, while atomic force microscopy, field emission scanning electron microscopy and transmission electron microscopy are used for morphological assessment. The TNT/MnO₂ junction shows a photocatalytic degradation efficiency of ~98.6% with good cyclic stability for Rhodamine B dye. Manganese doping tailors the optical band gap of TNT from ~3.04 eV to ~2.73 eV enabling the absorption of visible photons for carrier production and induces p-type conductivity in the sample. While valence band photoemission spectra give insight into the Fermi level positions of doped and undoped samples and confirm the p type conductivity of the latter, the photoluminescence measurements give an idea regarding the defect states. The reduction in the band gap of TNT on Mn doping along with the formation of an n-MnO₂ layer with a band gap ~1.50 eV on its top play a crucial role in the improvement of the photocatalytic performance of the pn- heterojunction device.

Keywords TiO₂ · Heterojunction · Mn doping · Photocatalysis · Band gap tailoring

1 Introduction

The wide usage of dyes in many textile and cosmetic industries and their unethical discharge into water bodies have resulted in water pollution which has a serious impact on

the ecological balance [1–3]. The release of pharmaceuticals into aquatic environment is also a serious threat to the quality of water [4]. Researches are being conducted to arrive at economical and eco-friendly ways to remove unwanted organic and inorganic pollutants from water [5–7]. Investigations on photocatalysts that can degrade the contaminants in water to non-toxic products in the presence of sunlight stand out top on this list [8–11]. Scientists encounter several challenges, including the fact that often the fabrication processes are quite expensive, or it is challenging to remove the photocatalysts themselves from water to reuse them. Worse yet, the by-products that remain after degradation are toxic [12–16].

Semiconducting metal oxides like TiO₂ and ZnO, have caught considerable attention as effective photocatalysts due to their non-toxicity and good photochemical stability [17–21]. But the band gap of pure TiO₂ around 3.2 eV [22, 23] allows absorption only in the UV region and extension of the band gap to the visible range of the solar spectrum is one of the greatest challenges faced by researchers on TiO₂. Doping with

✉ Rachel Reena Philip
reenatara@gmail.com

¹ Thin Film Research Lab, Department of Physics, Union Christian College, Aluva, Kerala 683102, India

² Sree Narayana Mangalam College, Maliankara, Kerala 683516, India

³ Facultad de Ingenieria Mecanica y Electrica, Universidad Autonoma de Nuevo Leon, Cd. Universitaria, Av. Universidad S/N, 66455 San Nicolas de los Garza, Nuevo Leon, Mexico

⁴ Beamline Development & Application Section, Bhabha Atomic Research Centre, Mumbai 400085, India

⁵ Homi Bhabha National Institute, Anushaktinagar, Mumbai 400094, India

Published online: 19 November 2022

Springer

Outcome of the Activity

Collaborative research works are very much helpful in the attainment of the objectives such as cooperation in the exchange of information relating to activities in research and in promoting appropriate joint research proposals.