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Dr.M.S.MUTHURAMALINGAM, M.Sc., M.Phil., B.Ed., Ph.D.
Principal i/c
A Veeraiya Vandayar Memorial
Sri Pushpam College (Autonomous)
Poondi, Thanjavur (Dt.)

A. VEERAIYA VANDAYAR MEMORIAL SRI PUSHPAM COLLEGE (AUTONOMOUS) POONDI 613 503, THANJAVUR DT.

PRINCIPAL
TAGORE GOVT. ARTS & SCIENCE COLLEGE
PUDUCHERRY-605 008.

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MEMORANDUM OF UNDERSTANDING

Dated 13th December, 2023

Between

Department of Physics, *A.V.V.M Sri Pushpam College* *(Autonomous), Poondi – 613 503,* *Thanjavur (Dt), TamilNadu, India.*	*Department of Physics,* *Tagore Govt. Arts & Science College,* *Lawspet, Puducherry - 605008,* *Puducherry U.T India.*

Departments of Physics, A.V.V.M Sri PushpamCollege(Autonomous), Poondi,Thanjavur (Dt)-613503, TamilNadu, India and Departments of Physics, Tagore Govt Arts & Science College, Lawspet Puducherry-605007, India hereby enter into this General Agreement to foster International Cooperation in Education and Research.

1. Both Parties agree to encourage the following exchange activities based on their respective academic and educational needs.

a. Exchange of Scholars
b. Exchange of Students
c. Exchange of Research facilities
d. Joint Research Programs
e. Joint Conferences
f. Joint Online Programs

g. Other Academic exchange Programme as may be agreed to by both the parties from time to time

2. The implementation of each exchange program referred above will follow the guidelines established on mutual agreement by both the parties. Efforts will be made by both the parties to find financial resources for carrying out the activities listed above.

3. Nothing shall diminish the full autonomy of either institution nor will any constraints be imposed by either upon the other in carrying out the agreement.

4. This agreement shall be in force for a period of FIVE YEARS from the date of the last signing and is subject to revision or modification by mutual consent. It is also understood that this agreement may serve as the basis for the specific agreements to be developed at a later date. It is further understood that either institution may terminate the agreement at any time, upon one year written notification to the partner institution, although such action will only be taken after mutual consultation in order to avoid any possible inconvenience to either party.

The Principal,
A.V.V.M Sri Pushpam College (Autonomous),
Poondi – 613 503, Thanjavur (Dt),
Tamil Nadu,India.

Dr.M.S.MUTHURAMALINGAM,Ph.D.
Principal i/c
A.Veeraiya Vandayar Memorial
Sri Pushpam College (Autonomous)
Poondi, Thanjavur (Dt.)

The Principal,
Tagore Govt Arts & Science College,
Lawspet, Puducherry - 605008
U.T of Puducherry, India.

5. Amendment to MOU

The Memorandum of Understanding may be amended in writing by mutual consent between both parties, IN WITNESS WHEREOF, the undersigned parties have agreed and executed this document in English in two originals.

For A.V.V.M Sri Pushpam College

WITNESSES:

1)

2)

Dr. K. Ravichandran Ph.D.,
Head, Department of Physics
AVVM Sri Pushpam College (Autonomous)
Poondi, Thanjavur - 613 503
Tamilnadu, India.

For Tagore Govt Arts & Science College

1)

2)

Dr. P. NALLASAMY, M.Sc.,M.Phil.,Ph.D.,
Associate Professor of Physics
Tagore Arts College
Puducherry - 605 008

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Assistant Professor of Physics
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Biocatalyst coupling with Mo-doped SnO_2 nanoparticles for efficient photocatalytic dye degradation: An eco-friendly approach for environmental remediation

R. Shalini, K. Ravichandran, P. Kavitha, P. K. Praseetha, R. Mohan & P. Ravikumar

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RESEARCH ARTICLE

Biocatalyst coupling with Mo-doped SnO_2 nanoparticles for efficient photocatalytic dye degradation: An eco-friendly approach for environmental remediation

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ABSTRACT

Specifically, biocatalyst coupled semiconductor photocatalysts have great potential towards the eco-friendly decomposition of toxic organic dyes that contaminate water bodies. This study reports the synthesis of vermiwash activated molybdenum doped tin oxide (Mo:SnO_2) nanomaterial, for the photocatalytic degradation of a representative cationic dye - methylene blue (MB). The photocatalytic performance of the synthesized nanoparticles was evaluated using UV-visible (UV-vis) spectroscopy and the degrading efficiency of MB dye was quantified. The addition of vermiwash resulted in a marked improvement in the photocatalytic activity of Mo:SnO_2 nanoparticles, with a degradation efficiency of 96% achieved after 75 min of irradiation. The nanoparticles were characterized using XRD, SEM-EDX, TEM, FTIR, XPS and UV-vis to confirm the crystal structure, morphology, functional groups, elemental analysis and bandgap energy by using Tauc's plot. The study demonstrates the potential of vermiwash as a green and efficient bio co-catalyst for improving the photocatalytic activity of Mo:SnO_2 nanoparticles regarding the degradation of textile effluents. Thus, this study paves a way for new eco-friendly approach for the synthesis of cost-effective, biocatalyst coupled semiconductor photocatalyst.

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Mo-doped SnO_2 nanoparticles; bandgap engineering; bio-catalyst; photodegradation efficiency; environmental remediation; wastewater treatment

1. Introduction

Discharge of untreated waste water from the textile industry has been a significant environmental problem, affecting both human health and eco-systems (Nethravathi et al. 2022). Textile waste water contains a variety of harmful chemicals such as dyes, bleaches and detergents, which can pollute the water bodies such as rivers and lakes. These pollutants can cause oxygen depletion in the water, leading to the death of aquatic organisms. When the waste water is disposed on land, it can contaminate the soil, which can impact the agriculture and plant growth (Khalid et al. 2018; Kishor et al. 2021; Al-Tohamy et al. 2022; Azanaw et al. 2022; Castillo-Suárez et al. 2023). It can accumulate in the food chain and cause health problems such as cancer, neurological damage and birth defects.

Development of efficient and sustainable strategies for degrading the organic pollutants in water is a major challenge in environmental science. Photocatalytic degradation using nanoparticles has emerged as a promising approach due to its ability to effectively remove a wide range of pollutants under mild reaction conditions (Nethravathi et al. 2022). In recent years, the development of efficient and eco-friendly photocatalysts has been the focus of intense research (Deletic and Wang 2019; Batra et al. 2022; Hazaraimi et al. 2022; Subhiksha et al. 2022). Photocatalysis is a promising technology for treating textile dyes in wastewater because it can breakdown the dye molecules into harmless by-products using light energy (Kumari et al. 2023). The efficiency of photocatalysis can be improved by optimizing the parameters, like pH (Ravichandran et al. 2023), process temperature (Buzuayehu Abebe et al. 2020) and catalyst loading (Das et al. 2018). The main advantages of photocatalytic water treatment are: low-cost, low-power consumption and involving less complex process. In addition, it can be easily scale up for industrial applications; it does not produce any harmful

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