

CURRICULUM VITAE

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Publications And Research Activities

Awads / Fellowships

- * AURF Fellowships (2017-2018)
- * RUSA 2.0 Ph.D Research fellowship (2018-2020)

Research Activities

Ph.D Thesis Title: Investigation of graphitic carbon nitride-based nanomaterials for photocatalytic hydrogen production and methylene blue dye degradation applications

The thesis work aims to study hybrid nanocomposites were synthesized based on 2D graphitic carbon nitride couples with different sizes of nanostructure binary metal oxides nanocomposite, metal oxide, and metal doping metal oxides (CuO/ ZnO, MnO₂, Nb, Fe-SnO₂). These powder photocatalysts were prepared for photocatalytic water splitting for hydrogen production and Methylene blue dye degradation applications. A considerable amount of hydrogen and Methylene blue degradation percentage has been achieved through different types of materials design. The structured design of photocatalyst is being suitable for the following type-II, Z-scheme, Schottky junction type like photocatalysis process.

In the first work we have achieved micron size flower like CuO/ZnO heterointerface bedecked on exfoliated g-C₃N₄ nanosheets which resulted in actively enhanced photocatalyst for H₂ evolution from water splitting and degradation of MB dye under visible and solar light respectively. The results indicate that the g-C₃N₄-CuO/ZnO photocatalyst can effectively catalyze H₂ evolution on the water splitting reactions and the degradation MB through Type-II and Z-Scheme heterojunction charge transfer process. The morphology and material combination of the nanocomposites play a very significant role in the light-harvesting process and transfer of photo-induced excitons as it can be confirmed by its photocatalytic performance. The photocatalytic performance of the g-C₃N₄-CuO/ZnO nanocomposite shows that hydrogen production reaches 102.2 μmol/h and dye degradation efficiency of MB by 99%.

In the second work we have achieved well synthesized most effective g-C₃N₄/g-C₃N₄(UMCN) heterojunction and Nb-doped UMCN heterojunction half curled worm like nanosheets through a simple one step pyrolysis technique using urea, melamine, and niobium chloride precursors. The synthesized UMCN and Nb-UMCN heterojunction nanomaterial's optical, morphology and photocatalytic properties were explored in very clear. due to the

synergetic effect of urea and melamine derived heterojunction and Nb doping, the Nb-UMCN photocatalyst reveals high photocatalytic efficiency of hydrogen production and MB dye degradation via schottky type heterojunction based on different work function. moreover, half curled worm like morphology also play a vital role in photocatalytic application with high surface area and suitable band-gap engineering. Besides, the Nb ion doped into UMCN heterojunction might exist at the state of Nb⁵⁺ and form Nb-N bonds with N atoms. This work prepared a reliably visible light photocatalyst for hydrogen production (321 μM/h) and MB dye degradation (96%) applications.

In the third one we have achieved the CN/Fe-SnO₂ photocatalysts were rationally designed for direct Z-scheme and type-II heterointerface mechanism successfully via hydrothermal method, achieving strong interaction between g-C₃N₄ and Fe-SnO₂. The intimate interface is favourable for the charge carrier transfer and separation. The optimized direct Z-scheme CN/Fe-SnO₂ photocatalyst exhibited superior photocatalytic activity towards H₂ evolution 931 μM/h, which is about ~4.3 -fold of g-C₃N₄ (216 μM/h). The Z-scheme charge transfer route not just achieves the spatial isolation of charge carriers but also endows the CN/Fe-SnO₂ photocatalyst with strong redox ability, thus providing large driving force for the photocatalytic water reduction reaction. Whereas, through Type-II heterointerface mechanism, the CN/Fe-SnO₂ photocatalyst achieved 97% of degradation efficiency for MB dye. Due to the 2D layer structure and flower like morphology play a vital role in photocatalytic efficiency.

In the fourth one we have achieved a 2D g-C₃N₄/1D MnO₂ Z-scheme hybrid structure containing ultrathin g-C₃N₄ platelets and α-MnO₂ nanorods. The α-MnO₂ acts as causative to stimulate the formation of exfoliation among g-C₃N₄ nanosheets through intercalation itself, and afterwards engages in a Z-scheme structure that catalyzes oxidation of sacrificial reagents. The optimized 2D g-C₃N₄/1D MnO₂ shows remarkable photocatalytic H₂ evolution activity, with a rate of 731 μmol h⁻¹ and very high apparent quantum efficiency of 26 % at a wavelength of 460 nm. Moreover, the 2D g-C₃N₄/1D MnO₂ reveals potential for overall water splitting. The highest performance of H₂ evolution in 2D g-C₃N₄/1D MnO₂ (5:1) is ascribed to: 1) exfoliated 2D layer structure of g-C₃N₄, granting permission effective transfer of the photogenerated electron to the reactant; 2) Z-scheme structure of 2D g-C₃N₄/1D MnO₂ suppress photogenerated excitons recombination ; and 3) closely intimate interface between 1D MnO₂ and 2D g-C₃N₄, enabling fast electron transfer from the conduction band of 1D MnO₂ to the valence band of 2D g-C₃N₄,

and further suppress the photogenerated electron–hole recombination in both materials. Moreover, 2D g-C₃N₄/1D MnO₂ nanocomposite shows enhanced MB dye degradation efficiency through Z-scheme heterojunction due to the suitable morphology design. It was achieved 98 % MB dye degradation efficiency.

Publications in International Journals

1. Sivasakthi, S., Amarnath, M., Radhakrishnan, K., & Gurunathan, K. (2021). Highly surface-active niobium doped g-C₃N₄/g-C₃N₄ heterojunction interface towards superior photocatalytic and selective ammonia response. *Applied Surface Science*, 561, 150077. **I.F. 6.3**
2. Sivasakthi, S., Imran, H., Gurunathan, K., Sagadevan, S., Mohammad, F., & Dharuman, V. (2020). Green synthesis of porous carbon nanocubes accumulated microspheres for the simultaneous non-enzymatic sensing of uric acid and dopamine in the presence of ascorbic acid. *Synthetic Metals*, 270, 116598. **I.F. 4.0**
3. Sivasakthi, S., & Gurunathan, K. (2020). Graphitic carbon nitride bedecked with CuO/ZnO hetero-interface micro flower towards high photocatalytic performance. *Renewable Energy*, 159, 786-800. **I.F. 9.0**
4. Sethuraman, Sivasakthi, and Gurunathan Karuppasamy. "Hetero intimate interface CN/Fe–SnO₂ micro flowers towards superior photocatalytic applications." *International Journal of Hydrogen Energy* 47, no. 59 (2022): 24691-24707. **I.F. 8.1**

Presented in International conferences/ seminars/workshops etc

S.No	Conference / Seminar / Workshop	International / National (I / N)	Title of the Event, Place & Date	Organized by	Title of Presentation (if any)
1	Workshop	N	National workshop on Emerging Sensor Technologies(NEST 19), January 7-8,2019	Dept.of Nanoscience and Technogoly, Bharathiar University, Coimbatore	Participated
2	Workshop	N	Advanced Nanomaterials for Sustainable Energy and Sensor Applications(AN-SEA 2020), March 4-6,	School of Physical and Chemical Sciences, Alagappa	Presented poster

			2020	University, Karaikudi	
3	Workshop	I	Biomedical Applications in Translational Research (BATR-2019) June 6 -7, 2019	Dept.of Biomedical Sciences & Health care centre Alagappa University Karaikudi &Semmelweis University Budapest, Hungary,	Participated
4	Conference	I	International Conference on Advanced Materials For Sustainable Energy and Sensors (INCAMSES - 2019) 16-17 September 2019.	Dept.of physics, Alagappa University, Karaikudi	Presented -poster
5	Conference	I	International Conference on Bioplastics(BIOP 2019) 2 , April 2019	Dept.of Microbiology, Alagappa University, Karaikudi	Participated
6	Conference	I	3 rd International Conference on Applied Nanoscience & Nanotechnology(ICANN-2019)	Dept.of Nanoscience and Technology, Alagappa University Karaikudi	Poster Presented
7	Virtual Webinar	I	Three days International virtual Seminar on the role of Nanotechnology against COVID-19	Dept.of Nanoscience and Technology, Alagappa University Karaikudi	Participated
8	Virtual Webinar	I	Indo-UK International Virtual Conference on Advanced Nanomaterials for Energy and Environmental Applications, 16-18, Sep.2020	Dept.of Nanoscience and Technology, Alagappa University Karaikudi and Brunel University	e-poster presentation
9	Workshop	N	National Workshop on Research Methodology (NWRM-2023)	Department of Physics, SRM Institute of Science and Technology, Ramapuram Campus, Chennai, India during 12-19 December, 2023	Participated

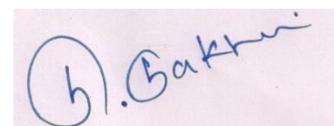
10	Conference	N	National Conference on Recent Advancements in Applications of Nanomaterials (RAAN-2023)	Department of Physics, A.V.V.M Sri Pushpam College, Thanjavur, India during 16- 17 October, 2023	Poster Presented
11	Conference	N	National Conference on Global opportunities and latest developments in Biotechnology.	Department of Biotechnology, J.J.College of Arts Science, Sivapuram, Pudukkottai, India during 4- 5 January, 2024	Poster Presented
12	Conference	I	International Conference on Recent advances in nanomaterials (ICRAN-2025)	PG and Research Department of Physics and chemistry, J.J.College of Arts Science, Sivapuram, Pudukkottai, India during 20- 21 February, 2025	Poster Presented

Declaration

I hereby declare that all the information furnished above is correct and true to the best of my knowledge.

Date: 02/05/2025

Place: Pudukottai



(Dr.S.Sivasakthi)