

BIOGRAPHY



SHALU ATRI

Faculty of Natural
Sciences CU

Project number
3305/03/02

Project duration
9/2022 - 8/2025

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I, Dr. Shalu is presently working as Marie-Curie postdoctoral fellow under SASPRO 2 program of EU Horizon 2022. I have also served as an Assistant Professor in the Department of Chemistry, Faculty of Science, SGT University, Gurugram, Haryana, India since Dec, 2020-2022. I have done my Ph.D. in 2020 under the supervision of Prof. Sitharaman Uma & Prof. Rajamani Nagarjan, Department of Chemistry, University of Delhi, Delhi, India. I received my Master of Science at Maharishi Dayanand University, Rohtak, Haryana, India. My current research focus is to investigate new MXene and MXene based materials with real time applications to fulfil the need of future energy storage and environmental remediation materials. I am author and co-author in more than 12 publications in peer-reviewed journals.

"In the present scenario, getting a good research fellowship itself is a strike out point in the research career. The proposed work will contribute to building a new hike in my research career due to its novelty. I will be connected more and collaborate with the researchers at national as well as international level. I will contribute to fulfilling the future demand of energy materials by producing H₂ gas with high efficiency but also to develop material for environmental remediation. The further results I could obtain by using the prepared materials in various reactions such as CO₂ reduction and antibacterial applications will also help to widen my skill for the future of my career.

Moreover, the proposed work is highly attractive and significant to contribute to future energy technology and environmental purification. By working on the proposed theme of work I will gather more information and hand-on experience of various advanced instrumental techniques and software's too. Moreover, I will be more specific, efficient in my research career by elaborating my knowledge and research skill in environmental application."

PROJECT SUMMARY

Investigation of Newly Synthesized MXene-based Solar Driven Photocatalysts in Environmental Remediation and Hydrogen Production

The present proposal is aimed to prepare new heterogeneous systems to remove organic pollutants from water (using advanced oxidation processes-AOPs) and also to produce H₂ gas as a clean energy source. Along with this direction, the synthesis of new MXene-based materials using mechanical or ultrasonic mixing methods will be approached. A first step will involve the preparation of cobalt/iron-based nanomaterials by employing wet chemical methods. The MXene-based materials will be derived from Ti₃C₂T_x, where T can be F-, OH- and different functional groups. Then, a series of MXene based photocatalysts will be prepared by the combination of the MXene with 0D, 1D, 2D and 3D Co/Fe-based nanomaterials. In order to confirm structural and morphological study, samples will be subjected to XRD, Raman, SEM and TEM measurements. Moreover, qualitative and quantitative estimation of the chemical composition of samples will be done by using energy dispersive spectrometer and X-ray photoelectron spectroscopy while the specific surface area will be assessed by using Brunauer-Emmett-Teller (BET) techniques. Optical properties of the samples will be estimated by using diffuse reflectance spectroscopy as well as photo electrochemical techniques. Besides successful characterization of the samples, the main theme of the proposed work will be approached by subjecting the samples in wastewater treatment and H₂ production. The mechanism of photocatalytic reactions will be studied in detail i.e. efficiencies, kinetics and mechanisms. For water treatments, analysis of degradation extent of different contaminants of emerging concern (CECs) will be performed in synthetic and real wastewaters using HPLC and TOC analyses, while the mechanism of degradation will be investigated by identifying the main reactive species, especially inorganic radicals. For H₂ production, different photoelectrochemical configurations will be tested so the use of MXene-based materials can be optimised.



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PUBLICATIONS

1. Shalu Atri, Sitharaman Uma, Rajamani Nagarajan*, Magnetic and Photocatalytic Properties of Nano-sized Sulfur-doped Trirutile Oxide, *CuSb₂O₆*, *Mater. Sci. Semicond. Process* 119 (2020) 105226. (I.F 3.085)
2. Shalu Atri, Meenakshi Pokhriyal, Sitharaman Uma*, Synergistic Influence of d⁰ (Nb⁵⁺) and d¹⁰ (Cd²⁺) Cations in Stabilizing Noncentrosymmetric Dion-Jacobson Layered Perovskites, A' Cd₂Nb₃O₁₀ (A' = Rb, Cs), *Inorg. Chem.* 59 (2020) 8044-8053. (I.F 4.97)
3. Shalu, S. Uma*, Soft-chemistry approach to synthesize Al³⁺, Ga³⁺, and Zr⁴⁺ stabilized ion-exchangeable layered perovskite oxides, *Cryst. Growth Des.* 19 (2019) 5019-5028. (I.F 4.089)
4. Shalu Atri, Vidhu Malik, Sitharaman Uma, Rajamani Nagarajan*, Catalytic applications of mesoporous CaBi₂O₄ obtained as single source precursor, *Res. Chem. Inter.* 45 (2019) 2457-2470. (I.F 2.99)
5. Shalu Atri, Meenakshi Gusain, Prashant Kumar, Sitharaman Uma, Rajamani Nagarajan*, Role of solvent medium in the Wet-chemical synthesis of CuSbS₂, Cu₃SbS₃, and bismuth substituted Cu₃SbS₃, *J. Chem. Sci.* 132 (2020) 132 (8pp) (I.F 2.15)
6. Anuj Kumar Tomar, Akanksha Joshi, Shalu Atri, Gurmeet Singh, Raj Kishore Sharma*, Zero-Dimensional Ordered Sr₂CoMoO_{6-δ} Double Perovskite as High-Rate Anion Intercalation Pseudocapacitance, *Appl. Mater. Interfaces. ACS* 12 (2020) 15128-15137. (I.F 9.229)

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