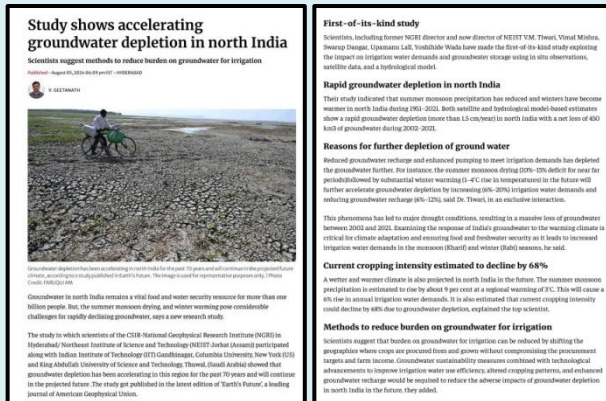
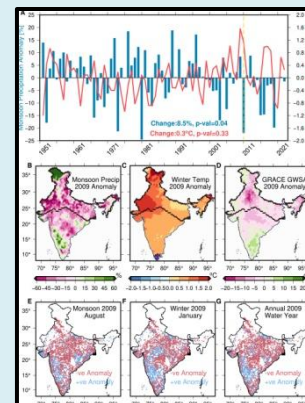


The Looming Threat: Groundwater Crisis in North India



A recent paper “Summer Monsoon Drying Accelerates India's Groundwater Depletion Under Climate Change” authored by Dr. V. M. Tiwari, Director of CSIR-NEIST, and his colleagues of the CSIR-North East Institute of Science and Technology Jorhat, CSIR-National Geophysical Research Institute (NGRI) Hyderabad and along with Indian Institute of Technology (IIT) Gandhinagar, Columbia University, New York (US) and King Abdullah University of Science and Technology, Thuwal, Saudi Arabia published by the American Geophysical Union (AGU) in a leading journal ‘Earth’s Future’ has brought to light critical findings on groundwater in northern India. This study provides new and important insights into the groundwater situation in northern India. It's the first detailed analysis of its kind, highlighting both the challenges and potential solutions for managing this critical resource. The study reveals that both the drying of the summer monsoon and the warming of winters are accelerating the depletion of this vital resource. These changes are creating less rainfall during the monsoon, means less water seeping into the ground to replenish aquifers, while warmer winters increase the need for irrigation, leading to more groundwater being pumped out. Using a combination of ground observations, satellite data, and advanced hydrological models, Dr. Tiwari and his team found that the region has seen a

significant decline in summer monsoon rainfall about 8% over the last 70 years. At the same time, winters have become progressively warmer. These trends have led to a rapid decrease in groundwater levels, with an estimated 450 cubic kilometers of groundwater lost between 2002 and 2021.



Looking to the future, the study warns that if these climate patterns continue, the situation will only worsen. By the end of the century, summer monsoon rainfall could drop by another 10% to 15%, while winter temperatures could rise by 1 to 4 degrees Celsius. This would result in a further 6% to 20% increase in irrigation demands and a 6% to 12% reduction in groundwater recharge, pushing the region's groundwater resources to the brink. To prevent a full-blown crisis, Dr. Tiwari and his colleagues emphasize the urgent need for sustainable groundwater management. This includes reducing the amount of groundwater being pumped for irrigation and finding ways to enhance recharge during the monsoon season. Without these measures, the future of agriculture and the millions of people who depend on it could be in trouble. This research serves as a wake-up call, highlighting the critical need to adapt to changing climate conditions to safeguard the water resources that sustain life in north India.

Article link:
<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2024EF004516>

Biosurfactant Production: Overcoming Challenges and Exploring Future Potential

An insightful article titled "Recent Progress in Microbial Biosurfactants Production Strategies: Applications, Technological Bottlenecks, and Future Outlook" has been published in the renowned journal 'Bioresource Technology' (Impact Factor: 9.7) authored by Dr. Jitendra Singh Verma and Dr. Sachin Ramesh Rao Geed. This article explores the intriguing world of biosurfactants, highlighting the latest breakthroughs and the challenges that still need to be addressed in their production and use.

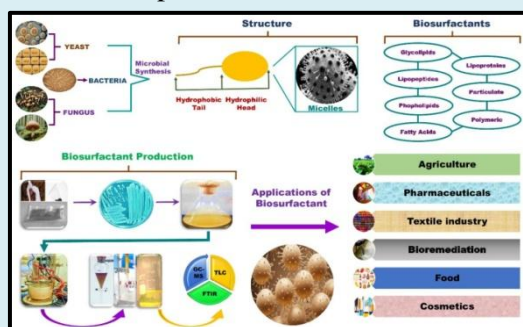


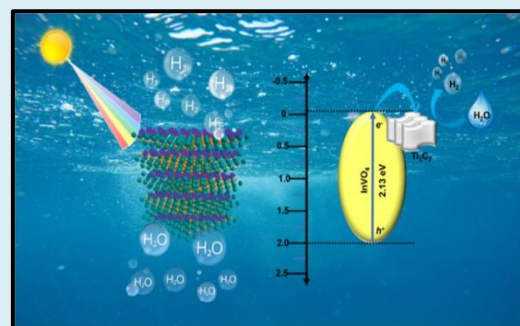
Fig: Production of biosurfactants

Biosurfactants, naturally produced by microbes, have captured significant interest due to their eco-friendly nature and versatile applications. The article thoroughly examines various production strategies, including batch, fed-batch, and continuous cultivation methods. It highlights how recent innovations have enhanced productivity and cost-effectiveness, making biosurfactants more viable for commercial use.

However, despite these promising developments, the authors acknowledge that there are still significant hurdles to overcome. High production costs, low yields, and challenges in scaling up production are just some of the issues that need to be addressed before biosurfactants can be widely adopted. But the future holds promise. The article suggests that ongoing research should continue to focus on improving production efficiency, developing new types of biosurfactants with even better properties, and exploring their potential in new and emerging industries.

Dr. Verma and Dr. Geed's work not only provides a snapshot of the current state of biosurfactant research but also offers a roadmap for future developments. Their dedication to finding sustainable, effective solutions shines through in this article, highlighting the exciting potential that biosurfactants hold for a greener, more innovative future.

Breakthrough in Hydrogen Production: New Photocatalyst Shows Great Promise



A new research paper has been published in the journal ACS Applied Materials & Interfaces (IF 8.9) titled "InVO₄ Decorated Ti₃C₂ MXene for Efficient Photocatalytic Hydrogen Evolution" authored by Sanmilan Jyoti Kalita JRF (DST-Inspire) CSIR-NEIST, Jorhat and Dr Lakshi Saikia Principal Scientist, CSIR-NEIST, Jorhat. The work demonstrates a promising approach of highly efficient InVO₄/Ti₃C₂ MXene (IVTC) heterostructures for excellent photocatalytic H₂ generation by water splitting under visible light irradiation.

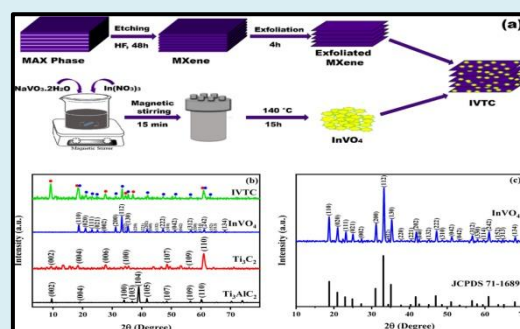


Figure: (a) Schematic representation for the synthesis of the IVTC heterostructure; (b) XRD patterns of the Ti₃AlC₂ MAX phase, Ti₃C₂ MXene, InVO₄, and IVTC(10%) heterostructure (In the IVTC XRD pattern, red dots indicate the peaks of Ti₃C₂ MXene, while blue dots correspond to the peaks of InVO₄); and (c) XRD patterns of InVO₄ with the JCPDS card.

The pursuit of sustainable hydrogen production through photocatalysis is a key strategy in tackling environmental challenges and the ongoing energy crisis. However, finding photocatalysts that are cost-effective, stable, and highly efficient for energy conversion continues to be a formidable challenge. In response to this, our team has developed innovative InVO₄/Ti₃C₂ MXene (IVTC) heterostructures. This process began with the acid etching of Ti₃C₂ MXene, resulting in an accordion-like structure, followed by the hydrothermal production of orthorhombic InVO₄ nanoparticles (NPs), and finally, their integration through a self-assembly method.

Advanced imaging techniques, such as field-emission scanning electron microscopy and high-resolution transmission electron microscopy, revealed that InVO₄ nanoparticles, averaging 43.4 nm in size, were evenly distributed across the Ti₃C₂ MXene surfaces and between its layers. The close interface formed between the Ti₃C₂ MXene nanosheets and InVO₄ particles

effectively reduced carrier recombination and facilitated charge transfer, leading to significantly improved photocatalytic hydrogen production.

Under visible light, the IVTC heterostructures with a 10% optimized loading of InVO₄ demonstrated more than a threefold increase in hydrogen evolution rates compared to pure InVO₄ nanoparticles, maintaining this efficiency over four cycles. This research offers a promising new approach to designing high-efficiency heterostructures with outstanding visible-light-driven photocatalytic activity for hydrogen production, potentially paving the way for more sustainable energy solutions.

EVENTS:

Celebrating 78th Independence Day with Patriotic Fervor and a Pledge for a Drug-Free India:



The 78th Independence Day was celebrated with pride and unity at CSIR-NEIST. The national flag was hoisted by Director-in-charge, Dr. Saurabh Barua, evoking a deep sense of patriotism among those present. A heartfelt address was delivered, reminding employees, students, and CSIR-NEIST family members of the values that unite the nation. A pledge for a "Drug-Free India" was also taken, reflecting a collective commitment to a brighter and healthier future for society.

Student Visits:



Group photo of the visitors with the programme coordinators and staff members

On August 23, 2024, a group of 62 students, accompanied by four teachers from various schools in Nagaon district, visited the CSIR-NEIST laboratories.

The visit was organized under the Jigyasa programme, an initiative designed to ignite curiosity and foster a love for science among young minds. The coordinators of the programme guided the students through the laboratories, where they witnessed research and technology firsthand.



Dr Dipankar Neog, Sr Principal Scientist delivering his speech



Mr Madhujya Saikia, Sr Technical Officer delivering the speech

Dr Dipankar Neog, Senior Principal Scientist and Mr Madhujya Saikia, Senior Technical Officer, addressed the students, engaging with them through inspiring discussions and encouraging them to pursue careers in science.

As the visit came to a close, the students left with a renewed sense of excitement and a clearer vision of the opportunities that a career in science could bring. The day was a testament to the power of mentorship and the importance of nurturing the next generation of scientists.

Celebrating National Sports Day with Fitness, Fun, and Community Spirit:



On 29th August 2024, CSIR NEIST celebrated National Sports Day with a series of spirited events, including the Fit India Pledge and remarks from officials. The day was marked by various sports activities, such as a marathon, badminton, arm wrestling, plank challenge, cricket match, musical chairs, and a football match. The event

was not only a showcase of sportsmanship but also a reaffirmation of the commitment to health, fitness, and community spirit.

ACHIEVEMENTS:

Phd:

Debashree Bora has completed her doctorate with a thesis titled "Synthesis and Characterization of Redox-Active N-Heterocyclic Carbene Metal Complexes and Their Catalytic Applications." She pursued her research under the supervision of Dr. Biswajit Saha, Senior Scientist at CSIR-NEIST.



Riturani Tamuly has earned her doctorate with a thesis titled "Thermochemical Conversion of Selective Biomass and Its Product Characteristics for Energy and Environmental Applications." Her research was carried out under the supervision of Dr. Prasenjit Saikia, Principal Scientist at CSIR-NEIST.



TEST SAMPLE REPORT:

Total Sample Received: 416

Type of Sample: 40

Test Report Dispatched: 23

PAPER PUBLISHED:

In International Peer Reviewed Journals

1. **Title:** Recent progress in microbial biosurfactants production strategies: Applications, technological bottlenecks, and future outlook

Authors: Vishal Thakur, Pawan Baghmare, Ashish Verma, Jitendra Singh Verma, Sachin Ramesh Rao Geed

Journal: *Bioresource Technology* 2024

<https://www.sciencedirect.com/science/article/abs/pii/S0960852424009155?via%3Dihub>

IF: 11.4

2. **Title:** Summer Monsoon Drying Accelerates India's Groundwater Depletion Under Climate Change

Authors: Vimal Mishra, Swarup Dangar, Virendra M. Tiwari, Upmanu Lall, Yoshihide Wada

Journal: *EARTHS FUTURE* 2024

<https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2024EF004516>

IF: 8.2

3. **Title:** Anti-inflammatory potential of *Piper betleoides* C. DC., a promising *Piper* species of Northeast India: in vitro and in vivo evidence and mechanistic insight

Authors: Rikraj Loying, Bhaben Sharmah, Hiranmoy Barman, Anupriya Borah, Himangsu Kousik Bora, Jatin Kalita & Prasenjit Manna

Journal: *Inflammopharmacology* 2024

<https://link.springer.com/article/10.1007/s10787-024-01539-3>

IF: 5.8

4. **Title:** Sterility Mosaic Disease of Pigeonpea (*Cajanus cajan* (L.) Huth): Current Status, Disease Management Strategies, and Future Prospects

Authors: B. R. Sayiprathap, A. K. Patibanda, Muttappagol Mantesh, Shridhar Hiremath, N. Sagar, C. N. Lakshminarayana Reddy, C. R. Jahir Basha, S. E. Diwakar Reddy, M. Kasi Rao, R. M. Nair and H. K. Sudini

Journal: *PLANTS-BASEL* 2024

<https://www.mdpi.com/2223-7747/13/15/2146>

IF: 4.5

5. **Title:** Development of Eco-Friendly and Durable Composites: Polypropylene Carbonate (PPC)-Polylactic Acid (PLA)/ZIF-8 for Packaging Applications

Authors: Dipjyoti Bora, Rituparna Duarah, Pankaj Barman, Jayaramudu Jarugala, Emmanuel R. Sadiku

Journal: *ACS APPLIED POLYMER MATERIALS* 2024

<https://pubs.acs.org/doi/10.1021/acsapm.4c01236>

IF: 5

6. **Title:** Access to Isoxazoles via Photo-oxygenation of Furan Tethered α -Azidoketones

Authors: Uma Devi Newar, Saurabh Kumar, Anupriya Borah, Satheesh Borra, Prasenjit Manna, Sabapathi Gokulnath and Ram Awatar Maurya

Journal: *JOURNAL OF ORGANIC CHEMISTRY* 2024

<https://pubs.acs.org/doi/10.1021/acs.joc.4c01312>

IF: 3.6

7. **Title:** Simultaneous Removal of As(III) and As(V) from Aqueous Solution by Using Iron-Functionalized Polythiophene: A Novel Approach toward Water Treatment

Authors: Rupkamal Chetia, Shrutipriya Devi, Nishant Shukla, Abhishek Hazarika, Shreemoyee Bordoloi, Binod Pokhrel, Binoy K Saikia, Ankur Gogoi and Surajit Konwer

Journal: *ACS OMEGA* 2024

<https://pubs.acs.org/doi/10.1021/acsomega.4c03184>

IF: 4.1

8. **Title:** In silico, in vitro, and in vivo acute and subacute toxicity profiling of whole plant methanol extract of *Equisetum*

difusum D. Don from the sub-Himalayan West Bengal, India, having ethnobotanical uses

Authors: Sourav Sarkar, Debabrata Modak, Sudipta Kumar Roy, Anupam Biswas, Mafdul Islam, Rinku Baishya, Sujoy Bose, John J. George and Soumen Bhattacharjee.

Journal: BMC Complementary Medicine and Therapies

<https://bmccomplementmedtherapies.biomedcentral.com/articles/10.1186/s12906-024-04606-y>

IF: 3.9

9. **Title:** Biochar carbon nanodots for catalytic acetalization of biodiesel by-product crude glycerol to solketal: process optimization by RSM and life cycle cost analysis

Authors: Supongsena Ao, Shiva Prasad Gouda, Lakshi Saikia, BaskarGurunathan & Samuel Lalthazuala Rokhum.

Journal: *Scientific reports* 2024

<https://www.nature.com/articles/s41598-024-69553-7>

IF: 4.6

10. **Title:** Electrospun nanofibrous membranes with functionalized 2D nanofillers for efficient micropollutant removal from water

Authors: Bhavesh Borban, Diksha Yadav, Moucham Borpatra Gohain, Sachin Karki, Ashmita Mukherjee, Paulomi Ghosh, Pravin G. Ingole

Journal: *Desalination* 2024

<https://www.sciencedirect.com/science/article/abs/pii/S0011916424007288>

IF: 9.9

11. **Title:** Pentahomoserine functionalized graphene oxide decorated polyamide thin film for enhanced separation of green tea polyphenols

Authors: Alimpia Borah, Rajiv Goswami, Monti Gogoi, Swapnali Hazarika

Journal: *Microchemical Journal* 2024

<https://www.sciencedirect.com/science/article/abs/pii/S0026265X24014577?via%3Dihub>

IF: 4.8

12. **Title:** The return period and probabilities of earthquakes occurrence in North-East, India (Eastern-Himalayas) and its vicinity inferred from Gutenberg–Richter relation

Authors: Timangshu Chetia, Bijit Kumar Choudhury, Ashim Gogoi & Namrata Saikia

Journal: *Journal of Earth System Science* 2024

<https://link.springer.com/article/10.1007/s12040-024-02375-3>

IF: 1.9

13. **Title:** A Carbon Dots-Cobalt Oxyhydroxide-Based Dual Optical Nanosensor for ppb-Level Detection of Sulfide Ions and H₂S in Aqueous Media and Alginate Beads

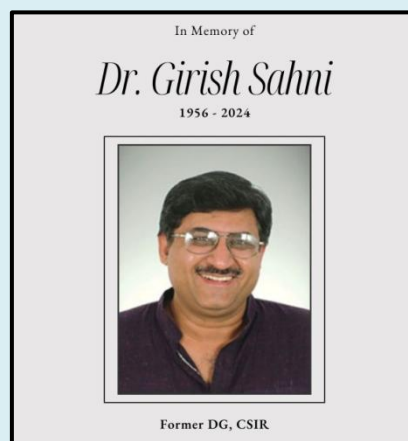
Authors: Amanda Ana Pinheiro, Ankit Thakuri, Sharanabasava D. Hiremath, Bhoben Sharmah, Prasenjit Manna, Mainak Banerjee and Amrita Chatterjee

Journal: *ACS APPLIED NANO MATERIALS* 2024

<https://pubs.acs.org/doi/10.1021/acsanm.4c03079>

IF: 5.9

CONDOLENCE:



CSIR-NEIST mourns the sudden and untimely passing of Dr. Girish Sahni, former Director General of CSIR. Dr. Sahni was a visionary leader whose contributions to the scientific community have left an indelible mark on the landscape of research and innovation in India. His dedication to advancing science and technology, coupled with his unwavering commitment to nurturing young talent, made him a true inspiration to all who had the privilege of working with him.

FAREWELL:

The following member(s) of the staff have retired from Council's service on superannuation from CSIR-NEIST w.e.f 31.08.2024.

1. Mr Prodip Hazarika, Lab Attendant