Vinay Patel

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Current position

Assistant Professor Grade II, Department of Bioscience and Biotechnology, Indian Institute of Technology, Kharagpur, India (June 2024- till date).

Additional responsibilities

- Department Career Development In-charge (Nov 2024 onwards)
- Faculty advisor (2024 BTech Batch)

Work experience

May 2022- June 2024	**Institute Postdoctoral Fellow,** Department of Biosciences and Bioengineering, Indian Institute of Technology, Bombay, India**.**
Dec 2017 to Apr 2018	**Senior Research Fellow,** Department of Biochemical Engineering & Biotechnology, Indian Institute of Technology, Delhi, India.
Dec 2015 to Oct 2017	**Technology Development Engineer (Team Lead),** Wrig Nanosystems (Now AeonLife), Delhi, India.
Aug 2014 to Nov 2015	**Researcher,** Tata Research Development and Design Centre, Pune, India.

Education

PhD, School of Biomedical Engineering, McMaster University, Canada May, 2018-2022

Thesis Title: **Solid-state phosphate sensor technologies for environmental and medical diagnostics**

- **Electropolymerized self-assembled monolayers** to develop a sensing platform with a wide detection range for H_2O_2 & its application in the detection of glucose, and galactose (Outcome: 1 Journal and 1 conference article).
- Devised a **low-cost thin metal leaf patterning** technique using xurography to manufacture electrochemical and chemiresistive sensors (Outcome: 1 Journal and 1 conference article).
- Developed an electrical pretreatment protocol to enhance sensitivity (~1.5 times) and eliminate the need for chemical pretreatment in solid-state phosphate sensors (Outcome:1 Patent, 1 Journal and 1 conference article).
- Mentored three undergraduate students (Outcome: One undergrad thesis, 1 Journal article (under preparation)).

B. Tech Biotechnology and Biochemical Engineering, IIT, Kharagpur, India 2010-2014

(Department rank =1)

Grants

No.	Project Title	Funding	Amount	PI/co-PI	Duration
1	In-field real time phosphate monitoring system for algal bloom prevention	Lab2Market and Mitacs	15000 (CAD)	PI	6 months (completed)
2	GlyASens: A handheld IoT enabled low-cost device for monitoring glycated albumin	BIG-BIRAC	50,00,000	PI	Ongoing
3	Development of on-chip solid-state chloride sensor for cystic fibrosis screening	IOE, IIT Bombay	9,00,000	PI	Ongoing

Awards/Fellowships

- Outstanding graduate student, Faculty of Health Sciences, McMaster University, Canada-2022.
- Nominated for **PhD thesis award** by PhD Defense committee, McMaster University, Canada-2022.
- Forge Startup Survivor program, McMaster University, Canada -2021 (**Runner-up** ~80 teams).
- **Mitacs Accelerate fellowship**, Lab2Market program, Ryerson University, Canada-2020 (one of 22 teams from universities across Canada).
- First Future Engineers for Water and Environmental Safety International Student competition-2018, organized by Sino-Canada joint R&D centre on water and environmental and UNICEF-China in Tianjin, China (**Second runner-up**, 15 Finalists).
- Hong Kong PhD Fellowship by Hong Kong research grants council -2018 (declined) (one of 200 candidates from all over the world).
- **Research excellence award**, Hong Kong University of Science and Technology, Hong Kong -2018 (declined).
- **Institute Silver medal**, Department of Biotechnology and Biochemical Engineering, Indian Institute of Technology, Kharagpur, India -2014 (**Department Rank 1**).
- **Best B. Tech Project,** Department of Biotechnology and Biochemical Engineering, Indian Institute of Technology, Kharagpur, India -2014.
- **J.C. Ghosh Memorial Endowment prize**, Indian Institute of Technology, Kharagpur, India -2013 (Highest CGPA at the end of 6^{th} term).
- **Dean's Letter of appreciation**, Undergraduate studies Indian Institute of Technology, Kharagpur, India-2013 (10.0/10.0, GPA).
- Summer Research Fellowship, Life Sciences, Indian Academy of Sciences India-2011.

Patents and publications

PATENT (Grated: 1, Application: 5)

- Shirsekar, V., Srivastava, R., **Patel, V.,** Smart mattress for preventive care of pressure ulcers. Indian Patent Application No: 202421097331, December 10, 2024.
- **Patel, V.,** Vinayak, R., Srivastava, R., Ghosh, A., Maske, P., Solid-state Chloride sensor and process for manufacturing thereof. Indian Patent No.: 54695, November 15, 2022.
- **Patel, V.,** & Selvaganapathy, P. R. (2022) Apparatus and methods for measuring phosphate in water. United States Patent App No. 17/888,942 filed: August 16, 2022.
- **Patel, V.,** Ghosh, A., Bodakhe, S. R., Srivastava, R., A portable device to detect saltiness in food materials. Indian Patent Application No.: 202221062865 dated November 3,2022.
- **Patel, V.,** Srivastava, R., Ghosh, A., Maske, P., Highly sensitive non-enzymatic lactate sensor. Indian Patent Application No.: 202221069432, December 1, 2022.

PUBLICATIONS (Total 19 publications)

1. Nandi, I., **Patel, V.**, Srivastava, R., & Chandra, P. (2024). Opto-electrochemical transducers for molecular sensing utilizing nanozyme-based sensing technologies. *Microchemical Journal*, *205*, 111360.
2. Dkhar, D. S., Kumari, R., **Patel, V.**, Srivastava, A., Prasad, R., Srivastava, R., & Chandra, P. (2024). Versatile Approaches of Quantum Dots in Biosensing and Imaging. Wiley Interdisciplinary Reviews: Nanomedicine and Nanobiotechnology, 16(5), e1998.
3. **Patel, V.,** Bhatt, S., Daspoddar, A., Shirsekar, V., Kumari, R., Chandra, P., & Srivastava, R. (2024). Evolution of materials, geometries, and fabrication of sweat patches and their use in high-throughput point-of-care/onsite sensing. Microchemical Journal (IF:4.9).
4. **Patel, V**., Mardolkar, A., Verma, R., Shelar, A., Srivastava, R. (2024), Wearable sweat chloride sensors: materials, fabrication and its applications, Analytical methods (IF=3.1).
5. **Patel, V**, Das, E., Bhargava, A., Deshmukh. S., Modi. A. (2023), Ionogels for flexible conductive substrates: Materials to fabrication methods. International Journal of Biological Macromolecules (IF = 8.2).
6. **Patel, V.,** Akbar, M. A., Kruse, P., & Selvaganapathy, P. R. (2023). A reagent-free phosphate chemiresistive sensor using carbon nanotubes functionalized with crystal violet. Analyst (IF =4.2).

7. **(Invited)** Shahriari, S.[#,] **Patel, V**. [#], & Selvaganapathy, P. R. (2023). Xurography as a rapid prototyping tool for fabrication of microfluidic devices, Journal of Micromechanics and Microengineering ([#]Co-first author, IF = 2.3).
8. **Patel, V**., Kruse, P., & Selvaganapathy, P. R. (2022). Solid state phosphate sensor technologies for environmental and medical diagnostics. The Journal of electrochemical society (IF =3.9).
9. **Patel, V.,** Saha, D., Kruse, P., & Selvaganapathy, P. R. (2022). Reagent-Free Hydrogen Peroxide Sensing Using Carbon Nanotube Chemiresistors with Electropolymerized Crystal Violet. ACS Applied Nano Materials, 5(3), 3957-3966. (IF=6.14).
10. **Patel, V**., Kruse, P., & Selvaganapathy, P. R. (2022). A xurography based rapid prototyping method to fabricate low-cost and high-quality metal thin film micropatterns using metal leaves. Materials Today Communications, 30, 103132. (IF=3.66).
11. **Patel, V.,** & Selvaganapathy, P. R. (2021). Enhancing the sensitivity of cobalt based solid-state phosphate sensor using electrical pretreatment. Sensors and Actuators B: Chemical, 130789 (IF=9.22).
12. **Patel, V**., Kruse, P., & Selvaganapathy, P. R. (2021). Solid State Sensors for Hydrogen Peroxide Detection. Biosensors, 11(1), 9 (IF=5.743) (**Selected as the Title story on the Journal homepage**).
13. Nandi, I., **Patel, V.**, Srivastava, R., & Chandra, P. (2024). Opto-electrochemical transducers for molecular sensing utilizing nanozyme-based sensing technologies. Microchemical Journal, *205*, 111360.
14. Darestani-Farahani, M., Fanqing, Ma, **Patel, V.**, Selvaganapathy, P. R., & Kruse, P. (2023). An Ion-Selective Chemiresistive Platform as Demonstrated for the Detection of Nitrogen Species in Water, Analyst (IF =4.2).
15. Fan, L., Wu, R., **Patel, V.,** Huang, J. J., & Selvaganapathy, P. R. (2023). Solid-state, reagent-free and one-step laser-induced synthesis of graphene-supported metal nanocomposites from metal leaves and application to glucose sensing. Analytica Chimica Acta, 341248 (IF = 6.911).
16. Saha, D., **Patel, V.**, Selvaganapathy, P. R., & Kruse, P. (2022). Facile fabrication of conductive MoS 2 thin films by sonication in hot water and evaluation of their electrocatalytic performance in the hydrogen evolution reaction. Nanoscale Advances, 4(1), 125-137. (IF=5.598) (**Highlighted as popular advances 2021**).
17. (**Invited**) Saha, D., Dalmieda, J., & **Patel, V.** (2023). Surface-Modified MXenes: Simulation to Potential Applications. ACS Applied Electronic Materials ***corresponding author** (IF = 4.494).
18. Kumar, M., Pandit, S., **Patel, V.,** Khanna, N., Nag, M., Lahiri, D., ... & Das, D. (2023). Maximization of Energy Recovery from Starch Processing Wastewater by Thermophilic Dark Fermentation Coupled with Microbial fuel Cell Technology. Geomicrobiology Journal, 1-12 (IF = 2.412).
19. Ghosh, A., Maske, P., **Patel, V.**, Dubey, J., Aniket, K., & Srivastava, R. (2024). Theranostic applications of peptide-based nanoformulations for growth factor defective cancers. International Journal of Biological Macromolecules, 129151 (IF = 8.2).
20. Pandit, S., **Patel, V.**, Ghangrekar, M. M., & Das, D. (2014). Wastewater as anolyte for bioelectricity generation in graphite granule anode single chambered microbial fuel cell: effect of current collector. International journal of environmental technology and management, 17(2-4), 252-267.

CONFERENCE PAPERS (peer-reviewed)

1. **Patel, V**., Bhargava, A., Puri, A., Ghosh, A., Srivastava, R., A pretreated electrodeposited nickel oxide film on gold PCB electrode for solid-state lactate sensing. In 2023 IEEE Biosensor.
2. **Patel, V**., Vinayak R., Maske, P., Srivastava, R., A reusable and reagent-free solid-state sensor for chloride detection. In 2023 IEEE APSCON.
3. **(Invited) Patel, V.**, Kruse, P., & Selvaganapathy, P. R A Xurography-Based Rapid Prototyping Method to Fabricate Low-Cost High Quality Metal Electrodes. In 2023 IEEE-ICEE.
4. **Patel, V.**, Kruse, P., & Selvaganapathy, P. R. Flexible chemiresistive sensor with xurographically patterned gold leaf as contact electrodes for measuring free chlorine. In 2021 IEEE International Conference on Flexible and Printable Sensors and Systems (FLEPS) (pp. 1-4). IEEE. (2021, June)
5. **Patel, V**., & Selvaganapathy, P. R. Cobalt based solid state phosphate sensor with submicromolar detection range. In 2020 IEEE Sensors (pp. 1-4). IEEE. (2020, October).
6. **Patel, V**., Kruse, P., & Selvaganapathy, P. R. Hydrogen peroxide chemiresistive detection platform with a wide range of detection. In 2019 IEEE Sensors (pp. 1-4). IEEE. (2019, October).

CONFERENCE PROCEEDINGS

1. **Patel, V.**, & Kruse, P., Selvaganapathy, P. R., (2021, October). An Electropolymerized Self Assembled Monolayer of Crystal Violet for Chemiresistive Hydrogen Peroxide Sensor. In *ECS Meeting Abstracts* (No. 57, p. 1919). IOP Publishing.
2. Saha, D., **Patel, V.**, Selvaganapathy, P. R., & Kruse, P. (2021, May). Direct Exfoliation of Conductive MoS2 Using Peroxide for Solid State Sensor and Catalytic Applications. In ECS Meeting Abstracts (No. 14, p. 675). IOP Publishing.

INVITED TALKS

1. International Conference on "Advancements in Diagnostic Technologies: Global Healthcare Monitoring-2024 (ADT-2024), Prayagraj, November 15-17, 2024.
2. INYAS Mid-year meeting 2024, IISER Kolkata, Sept 26-28, 2024.
3. People's Festival of Innovation (PFI) 2023, IIC, New Delhi, Nov 28-Dec 2, 2023.
4. 6th IEEE International Conference on Emerging Electronics, Bangalore, Dec 11-14, 2022.

CONFERENCE PRESENTATIONS

No.	Title of the conference/meeting	Dates	Place	Extent of participation
1.	93rd Annual Session and Symposium at NASI	Dec 3-5, 2023	BARC, Mumbai	Poster
2.	92nd Annual Session and Symposium at NASI	Dec 4-6, 2022	Allahabad, India	Talk
3.	240th ECS meeting	Oct 10-14, 2021	Virtual	Talk
4.	The Forge Startup Survivor Pitch Competition, McMaster University, Canada	October 7, 2021	Hamilton, Canada	Talk (2nd prize, cash (9,000 CAD)
5.	Faculty of Health Sciences Plenary, McMaster University	May 19-20, 2021	Hamilton, Canada	Talk
6.	10th annual BME symposium, McMaster University	April 20-21, 2021	Hamilton, Canada	Talk
7.	IEEE International Conference on Flexible and Printable Sensors and Systems (FLEPS)	June 20-23, 2021	Virtual	Talk
8.	IEEE Sensors-2020	Oct 25-28, 2020	Virtual	Poster
9.	3rd annual science meeting of Global Water Futures organized at University of Waterloo	May 11-13, 2020	Virtual	Poster
10.	IEEE Sensors-2019	Oct 27-30, 2019	Montreal, Canada	Talk
11.	2nd annual science meeting of Global Water Futures organized at University of Saskatchewan	May 15-17, 2019	Saskatoon, Canada	Talk
12.	McMaster Indigenous Graduate Students Symposium	March 14, 2019	Hamilton, Canada	Talk
13.	First Future Engineers for Water and Environmental Safety International Student competition, organized by Sino-	October 25-26, 2018	Tianjin, China	Talk (3rd prize, cash (15,000

	Canada joint R&D centre on water and environmental and UNICEF-China			RMB, citation)
14.	Research Society for the Study of Diabetes in India	October, 2015	Lucknow, India	Poster
15.	International Conference on Advances in biological hydrogen production and application	December 14-15, 2012	Hyderabad, India	Talk

BOOK CHAPTERS

- Selvaganpathy, R., **Patel, V.**,
- **Patel, V.**, Pramod, R., Khanna, N., Pawar, P., Mathuriya, A. S., & Pandit, S. Fundamentals of Biosensor Application in Environmental Pollutant Monitoring. In Removal of Emerging Contaminants Through Microbial Processes (pp. 311-329). Springer, Singapore.
- **Patel, V.**, Pandit, S., & Chandrasekhar, K. (2017). Basics of Methanogenesis in an anaerobic digester. In Microbial Applications Vol. 2 (pp. 291-314). Springer, Cham.

Peer review experiences

- Co-Guest Editor, **Biochips and Biosensors for Health-Care and Diagnostics,** Biosensor MDPI (IF: 5.743).
- Peer-reviewed for Microchemical Journal (IF: 4.9).
- Peer-reviewed for Environmental monitoring and assessment (IF: 3.307).
- Peer-reviewed for Journal of Electrochemical Society (IF: 4.386).
- Peer-reviewed for Chemical Papers (IF= 2.2, 2023 onwards).
- Peer-reviewed for IEEE sensor conference.
- Peer-reviewed for IEEE biosensor conference.

Entrepreneurial experience

Founder, PhosphoSens **Jun-2020 to Mar 2022**

At PhosphoSens, we are creating technology to enable rapid and hassle-free water quality monitoring.

- Developed a chemical-free phosphate detection technology (Outcome: 1 US patent)

Scientific outreach

2024	**Jury member,** Rajya Stariya Bal Vaigyanik Pradarshani, Kendriya Vidyalaya Sangathan, Kolkata Region 2024.
2023	**Member,** Royal Society of Biology, IEEE.
2023	Technical Co-chair**,** Student Research Forum (SRF) session in IEEE APSCON 2023.
2022	Organizing co-chair, Workshop on Electrochemical Biosensors in collaboration with Zimmer and Peacock at IIT Bombay -2022.
2021	**(Invited) Session Co-chair**, 4th annual Global Water Futures (GWF) science meeting, Virtual
2021	(Invited) Panelist for IEEE International Symposium on Technology and Society Special Session, Water and cities: Get in the game (Virtual)-2021.
2021	**(Invited)** Panelist for AUTM conference panel discussion on Lab2Market program, Virtual
2019-2022	**Editor**, Biomedical newsletter, School of Biomedical Engineering, McMaster University, Canada
2019-2020	Student volunteer, Let's Talk Science, McMaster University, Canada (Organized workshop for school children)
2019	**Co-Chair** organizing Committee-Global Engineering Conference (GEC-2019), Engineers Without Borders, McMaster University, Canada.

List of MTech and BTech mentored

Year	Course	Name	Thesis Title
2024-2025	Ongoing M. Tech	Ratnesh Gautam	Design and implementation of a Web based application for real time monitoring using a potentiostat.
2024-2025	Ongoing M. Tech	Pranav Kanjarla	Development and Characterization of an electrochemical biosensor for creatinine detection.
2024-2025	Ongoing M. Tech	Parth Barhate	Integrating Modern Physiological Metrics with Ayurvedic Diagnostics: A Data-Driven Approach to Personalized Health and Stress Management.
2024-2025	Ongoing M. Tech	Sayan Sarkar	Modifications on ENIG Finish of a PCB Electrode.
2024-2025	Ongoing B. Tech	Khushal Borban	A low cost potentiostat for electrochemical measurement.
2024-2025	Ongoing B. Tech	Nenavath Giri	Designing a portable sFtR based biosensor for detection of iron deficiency in resource limited settings.