

Dr. Pravin Kumari Dwivedi

Postdoctoral Researcher

Electrochemical Technologies

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PROFESSIONAL SUMMARY:

Ph.D. in Chemical Sciences with over 5 years of hands-on experience in battery materials research, including Li-ion, Na-ion, and Li-S batteries. Proven expertise in battery fabrication and testing, electrochemical characterization, and materials synthesis. Currently contributing to EU Horizon projects at VITO NV focused on critical metal recovery, battery recycling and NMC and LFP Cathode regeneration. Skilled in working in controlled atmospheres (glovebox) and operating advanced characterization instruments (BET, TGA, particle size analyzer, conductivity, etc.). Passionate about contributing to the energy transition through innovative R&D in battery technologies.

ACADEMIC QUALIFICATIONS:

- **Doctor of Philosophy (Ph.D.)** - Chemical Sciences (2014-2020)

Institute: AcSIR CSIR-National Chemical Laboratory, Pune, India

Title: “Development of Nanostructured Metal Oxides-Carbon Composites for Rechargeable Li-Ion Battery”

Supervisor: Dr. Manjusha V. Shelke (Senior Principal Scientist, CSIR-NCL, Pune, India)

- **CSIR-NET JRF** (2013) Chemical Science - All India Rank **42**.
- **M.Sc.** Chemistry - Banasthali University, Rajasthan, India. (2010-2012)
- **B.Sc.** Chemistry - Banasthali University, Rajasthan, India. (2007-2010)

RESEARCH EXPERIENCES:

1. Post-doctoral Researcher, (December 2022-Present)
Vlaamse Instelling voor Technologisch Onderzoek, (VITO NV), Mol, Belgium
2. Post-doctoral Fellow, (June 2021-November 2022)
Institute of Plasma Research (IPR) Gandhinagar, Gujarat, India
3. Research Associate, (August 2020-February 2021)
Indian Institute of Technology Delhi (IITD), New Delhi, India
4. Project Assistant, (Feb 2019- March 2020)
CSIR-National Chemical Laboratory Pune, Maharashtra, India

Ph.D. Research – Advanced Anode Materials for Lithium-Ion Batteries

- Synthesized and characterized metal oxide–carbon nanocomposites for LIBs, including Ni(OH)₂–Fe₂O₃/Carbon Nano Onions, PDA-derived N-doped carbon with NiFe₂O₄/NiO, and Co₃O₄-based hybrids.

- Investigated electrochemical performance, achieving high specific capacities, excellent rate capabilities, and long-term cycling stability.
- Demonstrated the role of heteroatom doping and carbon frameworks in enhancing conductivity and structural integrity.
- Explored potential applications of developed materials in sodium-ion batteries.

Postdoctoral Research – IIT Delhi

- Developed $\text{Na}_4\text{Co}_3(\text{PO}_4)_2\text{P}_2\text{O}_7$ /nitrogen-doped carbon (NCP/NC) composite as an anode for sodium-ion batteries.
- Achieved improved electrochemical performance and stability through enhanced ion diffusion and conductivity from N-doped carbon.
- Conducted cyclic voltammetry and rate capability studies to confirm reversible mechanisms and long-term cycling.

Postdoctoral Research – Institute for Plasma Research

- Investigated electrochemical corrosion behavior of plasma carburized/nitrided stainless steels and biomedical implants.
- Studied corrosion resistance in various electrolytes to assess material suitability for biomedical and industrial applications.

Current Research – VITO (Flemish Institute for Technological Research)

- Actively involved in EU Horizon projects (RHINOCEROS, RESTORE, CRM-GEOTHERMAL, LICORNE) focused on recovery of critical raw materials (Ni, Mn, Co, Li) from battery black mass and leachates.
- Conducted black mass leaching, selective separation, and scaling of the GDEx process; synthesized NMC cathode materials.
- Contributed to data analysis, reporting, project presentations, and supported project management in VITO-led work packages.
- Recently initiated research on CO_2 reduction technologies, expanding expertise in sustainable energy and environmental applications.
- Several publications based on current work are in preparation.

Technical Skills

- **Nanomaterials & Composites Synthesis-** Sol-gel, hydro/solvothermal, solid-state, CVD, lyophilization, and electrospinning techniques.
- **Battery & Energy Storage Research-** Li-ion, Na-ion, Li-S batteries, supercapacitors, CO_2 reduction, OER, and electrochemical corrosion studies.
- **Critical Metal Recovery-** Gas Diffusion ElectrocrySTALLIZATION technology for recovering high-purity critical metals from spent battery black mass.
- **Electrochemical Characterization-** Cyclic Voltammetry (CV), Galvanostatic charge-discharge, Electrochemical Impedance Spectroscopy (EIS), GITT, and potentiodynamic tests.
- **Instrumentation & Data Analysis-** PXRD, UV-Vis, FTIR, Raman, SEM, HRTEM, BET, TGA and XPS, Glove box, Electrode Coater, Slurry Mixer, Hot Roll Press, Potentiostat and battery tester.

Research Project Work:

Indian Institute of Technology, Roorkee, India (May 20, 2009, to June 20, 2009)
Synthesis and Characterization of Sulfonated PEEK Polymer for Polyelectrolyte Membrane Fuel Cell

AWARDS/Honor:

- Received **Best Oral Presentation award** in “National e-Conference on Materials for Emerging

Technologies, organized by Punyashlok Ahilya devi Holkar Solapur University, Solapur, India on March 22, 2021.

- Received honours to delivered talk as **guest speaker** on National Webinar On “Energy Storage for Sustainable Environment” Organized by Department of Chemistry & Physics under the Aegis of MPHEQIP held on February 25, 2021.
- Received the “**Prof. S. T. Nandibewoor Young Scientist award for the Best Oral Presentation**” in ‘the 56th Annual Convention of Chemists 2019 and International Conference on Recent Trends in Chemical Sciences’ organized by Indian Chemical Society, Kolkata at School of Studies in Chemistry, Pt. Ravishankar Shukla University, Raipur during November 14-16, 2019.
- Received **Best Poster Presentation award** in physical chemistry divisional day at CSIR- National Chemistry Laboratory, Pune, India on November 30, 2017.
- Received third **Best Poster Presentation award** in “The International Conference on Advanced Rechargeable Batteries & allied Materials (**ICARBM-2017**)” organized by Centre for Materials for Electronics Technology (C-MET), Pune, India on March 8-10, 2017.
- Qualified **CSIR-National Eligibility Test-JRF in Chemical sciences (All India Rank-42)** conducted by Council of Scientific and Industrial Research (CSIR)- University Grants Commission (UGC), India in June 2013.
- Received the summer research fellowship program, jointly sponsored by **IASc (Bangalore), INSA (New Delhi) and NASI (Allahabad)** and worked at Solid State and Structural Chemistry Unit, **Indian Institute of Science, Bangalore, India** (May 16, 2011, to July 8, 2011).

RESEARCH PUBLICATIONS:

1. **Pravin Dwivedi**, Alphonsa Joseph, Ramkrishna Rane, et al.; “Electrochemical Corrosion Investigation of Plasma Nitrided Ti-6Al-4VAlloy in Different Simulated Solution”, **Journal of Materials Engineering and Performance**, Year 2025 (**Accepted**). IF: 1.8, H5 Index-54
2. VijayabhaskaraRao Bhaviripudi, **Pravin Dwivedi**, DurgaPrasad Pabba, Radhamanohar Aepuru, Umesh T. Nakate, Rodrigo Espinoza-González, Manjusha V. Shelke; “Evaluation of Fe₃O₄ incorporated functionalized carbon nanotube self-standing buckypaper as electrodes for solid-state symmetric supercapacitor”, **Journal of Energy Storage**, Vol. 73, Page 109101, Year 2023, IF-9.94, H5 Index-81.
3. Jeet Sah, **Pravin Dwivedi**, Subroto Mukherjee, Ghanshyam Jhala, and Alphonsa Joseph; “Influence of γ_N and ε_N phases on the properties of AISI 304L after low-temperature plasma nitrocarburizing”. **Journal of Vacuum Science and Technology**, Vol. 41, Page 033101, Year 2023, IF-2.9, H5 Index-119.
4. Thripuranthaka M., Vikash Chaturvedi, **Pravin Kumari Dwivedi**, Arun Torris, and Manjusha V. Shelke; “3D X-ray microtomography investigations on the bimodal porosity and high sulfur impregnation in 3D carbon foam for Li-S battery application”, **Journal of Physics: Energy**, Vol. 4, Page 014003, Year 2022, IF-7.528, H5 Index-17.
5. **Pravin Kumari Dwivedi**, S. K. Sapra, J. Pati and R. S. Dhaka; “Na₄Co₃(PO₄)₂P₂O₇/NC Composite as a Negative Electrode for Sodium-Ion Batteries”, **ACS Applied Energy Materials**, Vol. 4, Page 8076–8084, Year 2021, IF-6.959, H5 Index-71.
6. Asiya F. Shaikh, Mohaseen S. Tamboli, C. S. Praveen, **Pravin Kumari Dwivedi**, Indrapal Karbhal, Suresh W. Gosavi, Manjusha V. Shelke, Bharat B. Kale; “Architecture of NaFe(MoO₄)₂ as a Novel Anode Material for High Performance Lithium and Sodium Ion Batteries”, **Applied Surface Science**, Vol. 559, Page

7. Asiya M. Tamboli, Mohaseen S. Tamboli, **Pravin Kumari Dwivedi**, C. S. Praveen, Indrapal Karbhali, Manjusha V. Shelke, Bomyung Kim, Chinho Park and Bharat B. Kale; “Engineering Microstructure of LiFe(MoO₄)₂ as an Advanced Anode Material for Rechargeable Lithium-ion Battery”, **Journal of Materials Science: Materials in Electronics**, Vol. 32, Page 1-12, Year 2021, IF- 2.8, H5 Index- 62.
8. S. K. Sapra, J. Pati, **Pravin Kumari Dwivedi**, S. Basu, S. Dsoke, J.-K. Chang, and R. S. Dhaka; “A comprehensive review on recent advances of polyanionic cathode materials in Na-ion batteries for cost effective energy storage applications”, **WIREs Energy and Environment** Vol. 2, Page e400, Year 2021, IF- 3.154, H5 Index- 47.
9. **Pravin Kumari Dwivedi**, Aathira Nair, Rupali S Mehare, Vikash Chaturvedi, Kavita Joshi, Manjusha V Shelke; “Experimental and theoretical investigations of the effect of heteroatom doped Carbon microsphere support on stability and storage capacity of nano-Co₃O₄ conversion anode for Lithium-ion batteries” **Nanoscale Advances**, Vol. 2, Page 2914-2924, Year 2020, IF-5.598, H5 Index- 46.
10. **Pravin Kumari Dwivedi**, Golu Parte, M. Thripuranthka, Dr. Manjusha V Shelke; “High Efficiency Lithium Storage in 3D Composite Foam of Co₃O₄ Nanoparticles Integrated Carbon Nanohorns”, **Material Science and Engineering B**, Vol. 263, Page 114839, Year 2020, IF- 3.6, H5 Index- 129.
11. **Pravin Kumari Dwivedi**, Ashvini B. Deshmukh, Archana C. Nalawade, Mohammed S. Qureshi, Manjusha V. Shelke; “Highly durable Li-ion battery anode from Fe₃O₄ nanoparticles embedded in nitrogen-doped porous carbon with improved rate capabilities”, **Journal of Materials Science**, Vol. 55, Page 15667-15680, Year 2020, IF-4.5, H5 Index- 73.
12. Poonam Yadav, Wahid Malik, **Pravin Kumari Dwivedi** and Manjusha V. Shelke; “Electrospun Nanofibers of Tin Phosphide (SnP0.94) Nanoparticles Encapsulated in a Carbon Matrix: A Tunable Conversion-cum-Alloying Lithium Storage Anode”, **ACS Energy Fuels**, Vol. 34, Page 7648-7657, Year 2020, IF- 4.654, H5 Index- 155.
13. Khalid Bin Masood, Golu Parte, Neha Jain, **Pravin Kumari Dwivedi**, Pushpendra Kumar, Manjusha V. Shelke, and Jai Singh; “Electrochemical performance of pre-lithiated ZnMoO₄ and r-GO@ZnMoO₄ composite anode for lithium-ion battery application”, **Journal of the Taiwan Institute of Chemical Engineers**, Vol. 112, Page 60-66, Year 2020, IF-5.477, H5 Index- 103.
14. Vedi Kuyil Azhagan Muniraj, **Pravin Kumari Dwivedi**, Parikshit Shivaji Tamhanea, Sabine Szuneritsc, Rabah Boukherroub and Manjusha Vilas Shelke; “High energy flexible supercapacitor - Synergistic effects of Polyhydroquinone and RuO₂·xH₂O with micro-sized, few layered, self- supportive exfoliated-graphite sheets”, **ACS Appl. Mater. Interfaces**, Vol. 11, Page 18349-18360, Year 2019, IF- 9.46, H5 Index- 284.
15. **Pravin Kumari Dwivedi**, Poonam Yadav, Golu Parte and Manjusha V. Shelke; “Metal Oxides/Sulphides/phosphides: High specific energy conversion anodes for Li ion batteries”, **SMC Bulletin Journal, Society for Materials Chemistry**, Vol. 10, Page 133, Year 2019.
16. Anil A. Kashale, Akash S. Rasal, Gokul P. Kamble, Vijay H. Ingole, **Pravin Kumari Dwivedi**, Swapnil J. Rajoba, Lata D. Jadhav, Jia-Yaw Chang and Anil V. Ghule; “Biosynthesized Co-Doped TiO₂ Nanoparticles based Anode for Lithium-Ion Battery Application and Investigating the Influence of Dopant Concentrations on its Performance”, **Composites Part B: Engineering**, Vol. 167, Page 44-50, Year 2019, IF-11.32, H5 Index- 146.
17. **Pravin Kumari Dwivedi**, Vedi Kuyil Azhagan Muniraj, Dr. Rami Reddy Deverapalli, Dr. Manjusha V Shelke; “Ni(OH)₂-Fe₂O₃/CNOs ternary nanocomposite designed as an anode with complementary properties for high-performance Li-ion battery”, **Chemistry Select**, Vol. 3, Page 2286 - 2292, Year 2018, IF-2.3, H5 Index- 51.
18. Anil A. Kashale, **Pravin Kumari Dwivedi**, Bhaskar R. Sathe, Manjusha V. Shelke, Jia-Yaw Chang, and

Anil V. Ghule.; "Biomass-Mediated Synthesis of Cu-Doped TiO₂ Nanoparticles for Improved- Performance Lithium-Ion Batteries", **ACS Omega**, Vol. 3, Page 13676-13684, Year 2018, IF-4.1, H5 Index- 77.

19. Anupam Biswas, Mayuresh A Kulkarni, Rangarajan Bakthavatsalam, Sourik K Mondal, **Pravin Kumari Dwivedi**, Manjusha V Shelke, Radhamonyamma N Devi, Arun G Banpurkar; "Facile Synthesis and Self-Cleaning Application of Bimetallic (CuSn, CuNi) Dendrites", **ChemistrySelect**., Vol. 2, Page 5552 – 5563, Year 2017, IF-2.3, H5 Index- 51.

BOOK CHAPTERS:

1. Pushpendra Kumar, **Pravin Kumari Dwivedi**, Poonam Yadav and Manjusha V. Shelke, "Nanostructured Materials for Li-Ion Battery Applications." Environmental Chemistry for a Sustainable World. In Emerging Nanostructured Materials for Energy and Environmental Science, **Springer**, Cham, (2019) 105-172.
2. Poonam Yadav, **Pravin Kumari Dwivedi**, Surendar Tonda, Rabah Boukherroub and Manjusha V. Shelke "Metal and Non-Metal doped Metal Oxides and Metal Sulphides for Photocatalysis", Environmental Chemistry for a Sustainable World. In Green Photocatalysts, Springer, Cham, (2020) 89-132.

REFERENCES

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