VISHAL KOTHA

Materials Chemistry | Nanofabrication | Electrocatalysis | Microscopy
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PROFESSIONAL SUMMARY

Materials scientist with a Ph.D. in Chemistry from IIT Bombay and over 7 years of experience in synthesizing and characterizing nanomaterials and thin films for semiconductor, battery materials, electrocatalysis, and solar cells. Proficient in advanced techniques (TEM, SEM, XPS, XRD, AFM, CV, ALD, CVD), lithography (electron & photo) and scalable synthesis methods (hydrothermal, mechanochemical). Published 11 peer-reviewed articles in high-impact journals, including ACS Appl. Energy Mater. and J. Mater. Chem. A. Adept at leading projects, collaborating with multidisciplinary teams.

EDUCATION

2016 – 2022 **Ph.D. in Chemistry,** *Indian Institute of Technology Bombay* |Mumbai, India CPI: 8.44/10

Thesis: *Tailoring Transition Metal Perovskite Oxides via Low-Temperature Hydrothermal Routes as Potential Candidates for Catalytic Applications*
Supervisor: Prof. Leela Srinivas Panchakarla (late)

2014 – 2016 **M.Sc. in Chemical Sciences**, *Pondicherry University* | Puducherry, India CGPA: 8.4/10

Thesis: *On the Origin of Chink in B_4C Armor: Anatomy of a classical 2c-2e B-B bond*
Supervisor: Prof. Musiri M. Balakrishna Rajan

2011 – 2014 **B.Sc. in Chemistry**, *Khallikote Unitary University* | Odisha, India Percentage in Hons: 85.4%

Graduated with Gold Medal for outstanding performance.

PROFESSIONAL EXPERIENCE

2024 – 2025 **Sabbatical for Societal Contribution,** *Isha Foundation*; Coimbatore, India

- Engaged in a 7-month residential program to enhance mental clarity, resilience, and teamwork through structured volunteering and mindfulness practices, honing project management skills for dynamic R&D environments.
- Developed precision and adaptability in collaborative settings, preparing for multidisciplinary projects in materials engineering and process optimization.

2023 – 2024 **Postdoctoral Fellow**, *Weizmann Institute of Science*; Rehovot, Israel

- Pioneered chirality induction in Ni-Au systems for hydrogen evolution reaction (HER), improving efficiency by 10% for green fuel applications, characterized via TEM and XPS.
- Collaborated with international teams, demonstrated superior HER activity, emphasizing sustainable catalysis potential (terminated early due to regional conflict).

2022 – 2023 **Postdoctoral Fellow**, *Indian Institute of Technology Bombay*; Mumbai, India

- Investigated magneto-electric effects on water electrolysis using La_2FeMnO_6, advancing multi-ferroic catalysts for energy conversion.
- Conducted mechanochemical shear-induced nucleation and exfoliation of nanomaterials, contributing to scalable synthesis techniques for industrial energy applications.

2016 – 2022 **PhD researcher**, *Indian Institute of Technology Bombay*; Mumbai, India

- Led hydrothermal synthesis of K-substituted $LaMnO_3$ perovskite for zinc-air batteries and organocatalysis, resulting in 3 high-impact publications.
- Operated and trained peers on characterization tools (FEG-TEM, SEM-EDS, PXRD, ICP-AES), logging 500+ hours and mentoring 4 students.
- Fabricated MOSFET devices using 1D nanorods, exploring interconnects for energy-efficient electronics.

KEY PROJECTS

- **Chiral Ni-Au Electrocatalysts (Weizmann, 2023–2024):** Developed chiral metal systems for enhanced HER, supporting hydrogen production for green fuels, characterized via TEM and XPS.
- **K-Substituted $LaMnO_3$ Catalysts (IIT Bombay, 2017–2023):** Synthesized cost-effective perovskites for zinc-air batteries and organic reductions, published in ACS Appl. Energy Matter.
- **MOSFET Fabrication (IIT Bombay, 2019–2021):** Fabricated 1D nanorod interconnects using ALD and lithography, enhancing energy-efficient device performance.
- **Dynamic Hydrothermal Synthesis (IIT Bombay, 2016–2020):** Tuned La-based perovskite nucleation for energy applications, using seed-assisted methods, laying groundwork for scalable catalysis.

TECHNICAL SKILLS

- **Synthesis:** Hydrothermal, mechanochemical, solid-state, solution-based, electroplating, CVD.
- **Characterization:** TEM (HR, SAED, EDAX), SEM (EDS), XRD (Rietveld refinement), XPS, AFM, ICP-AES, CV, LSV, Impedance, Ellipsometry.
- **Fabrication:** Electron beam lithography, Photolithography, Sputtering, ALD
- **Software:** Python (data analysis), FullProf_Suite, PANalytical HighScore+, VASP, Gaussian, OriginLab, ChemDraw, ImageJ.
- **Project Management:** Led focused projects, trained teams, managed lab operations.

PUBLICATIONS

1. Nishad, H. S.; **Kotha, V.**; Sarawade, P.; Chaskar, A. C.; Mane, S.; Lee, J.; Walke, P. S. Exchanging interlayer anions in NiFe-LDHs nanosphere enables superior battery-type storage for high-rate aqueous hybrid supercapacitors. *J. Mater. Chem. A* 2024, 12 (16), 9494–9507. DOI: 10.1039/D4TA00299G.

2. Gupta, S. P.; **Kotha, V.**; Walke, P. S.; Panchakarla, L. S. Hydrated $WO_3 \cdot 0.33H_2O$ nanorod for excellent anode materials enables high performance and long-cycle stability for aqueous Zn-ion batteries. *J. Power Sources* 2024, 604, 234500. DOI: 10.1016/j.jpowsour.2024.234500.

3. Nishad, H. S.; Gupta, S. P.; **Kotha, V.**; Magdum, V. V.; Gawade, V. V.; Patole, P. S.; Biradar, A. V.; Walke, P. S. Sodium-substituted tungsten oxide nanoflowers: An efficient electrode enhancing the pseudocapacitive storage in aqueous asymmetric supercapacitors. *ChemNanoMat* 2024, 10 (2), e202300463. DOI: 10.1002/cnma.202300463.

4. **Kotha, V.***; Karajagi, I.; Ghosh, P. C.; Panchakarla, L. S. Potassium-substituted $LaMnO_3$ as a highly active and exceptionally stable electrocatalyst toward bifunctional oxygen reduction and oxygen evolution reactions. *ACS Appl. Energy Mater.* 2022, 5 (6), 7297–7307. DOI: 10.1021/acsaem.2c00823.

5. **Kotha, V.***; Reddy, P. L.; Maddu, D.; Panchakarla, L. S. Importance of K substitution in $LaMnO_3$ nanostructures for the selective reduction of α,β-unsaturated carbonyl compounds and nitroarenes. *ACS Appl. Nano Mater.* 2022, 5 (12), 17482–17486. DOI: 10.1021/acsanm.2c03867.

6. **Kotha, V.**; Kumar, K.; Dayman, P.; Panchakarla, L. S. Doping with chemically hard elements to improve photocatalytic properties of ZnO nanostructures. *J. Clust. Sci.* 2022, 33 (5), 1943–1950. DOI: 10.1007/s10876-021-02115-3.

7. Bhavani, B.; Chanda, N.; **Kotha, V.**; Reddy, G.; Basak, P.; Pal, U.; Giribabu, L.; Prasanthkumar, S. 1D alignment of Co(II) metalated porphyrin-naphthalimide based self-assembled nanowires for photocatalytic hydrogen evolution. *Nanoscale* 2022, 14 (1), 140–146. DOI: 10.1039/D1NR06961F.

8. Nishad, H. S.; Gupta, S. P.; **Kotha, V.**; Patil, B. M.; Chakane, S. D.; Bute, M. G.; Gosavi, S. W.; Late, D. J.; Walke, P. S. Enhanced van-der-Waals separation in hydrated tungsten oxide nanoplates enables superior pseudocapacitive charge storage. *J. Alloys Compd.* 2022, 914, 165227. DOI: 10.1016/j.jallcom.2022.165227.

9. Bera, A.; Pathak, S. S.; **Kotha, V.**; Prasad, B. L. V. Lamellar bimetallic thiolates: Synthesis, characterization, and their utilization for the preparation of bimetallic chalcogenide nanocrystals through mechanochemical grinding. *Adv. Mater. Interfaces* 2021, 8 (23), 2100898. DOI: 10.1002/admi.202100898.

10. Sugathan, V.; Ghosh, B.; Harikesh, P. C.; **Kotha, V.**; Vashishtha, P.; Salim, T.; Yella, A.; Mathews, N. Synthesis of bismuth sulphoiodide thin films from single precursor solution. *Sol. Energy* 2021, 230, 714–720. DOI: 10.1016/j.solener.2021.10.041.

11. Mrinalini, M.; Suman Krishna, J. V.; Krishna, N. V.; **Kotha, V.**; Panchakarla, L. S.; Prasanthkumar, S.; Giribabu, L. Photobleaching of triphenylamine-phthalocyanine entails mixed valence-state triggered self-assembled nanospheres. *J. Phys. Chem. C* 2018, 122 (34), 19946–19952. DOI: 10.1021/acs.jpcc.8b05068.

POSITIONS OF RESPONSIBILITY

- FEG-TEM Assistant, IIT Bombay (2017–2022): Managed sample prep, imaging, and EDS for 500+ hours.
- PXRD Assistant, IIT Bombay (2018–2022): Conducted Rietveld refinement for 20+ samples.
- FESEM-EDS Assistant, IIT Bombay (2020–2023): Optimized surface and elemental analysis.
- Mentor, IIT Bombay (2018–2020): Guided 1 PhD, 2 M.Sc., 1 B.Sc. student.

ACHIEVEMENTS

- Qualified GATE (97.06 percentile, Chemistry, 2016) and IIT-JAM (2014).
- Gold Medalist, B.Sc., for academic excellence.
- Trained 3 PhD students in TEM/SEM operation, enhancing lab efficiency.

REFERENCES

- **Bhagavatula L.V. Prasad**, Director, CeNS, Bengaluru, IN | pl.bhagavatula@ncl.res.in
- **Anindya Datta**, Professor, IIT Bombay, IN | anindya@chem.iitb.ac.in
- **Seelam Prasanth Kumar**, Scientist, CSIR-IICT, IN | prasanth@iict.res.in