Victor Kumar Sharma

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Summary

Dynamic chemical engineer (Ph.D.) with 6 years of experience in process technology, small molecule and polymer synthesis, and technoeconomic modeling. Proven expertise in developing and leading innovative processes, contributing to multidisciplinary teams, and ensuring safe execution of laboratory experiments. Effective communicator, proactive problem-solver, and collaborative team player with a strong focus on delivering breakthrough solutions.

Education

- **Ph.D. in Chemical Engineering (GPA- 3.90/4)** University of Kansas Advisor: Alan M. Allgeier
- Master's in Chemical Engineering (GPA- 8.67/10) Indian Institute of Technology Guwahati Advisor: Vimal Katiyar
- Bachelor's in Chemical Engineering (GPA- 7.90/10) West Bengal University of Technology

August 2019– January 2024 Lawrence, Kansas

August 2017 – June 2019 Guwahati, India

August 2012 – June 2016 Kolkata, India

March 2024 – present

Oak Ridge, TN, United States

Experience

1) Postdoctoral Research Associate

Oak Ridge National Laboratory

- Spearheading the development of a high-throughput biocatalyst screening method targeted to polyester synthesis, driving innovation within a multidisciplinary enzyme engineering initiative and generating ideas for new use cases
- Leading the safe and effective scale-up of biocatalytic polymer synthesis using immobilized enzymes in flow reactors, with in situ monitoring through advanced spectroscopy and liquid chromatography techniques
- Collaborating closely with chemists, technologists, and materials scientists to ensure successful laboratory and scale-up experiments, emphasizing process safety and technological excellence

2) Graduate Research Assistant University of Kansas

- Led and contributed to 3 multidisciplinary projects with industry and university partners, optimizing biocatalytic processes for synthesizing small molecules like acetaldehyde, furfuryl alcohol, and mannitol, achieving ~100% product selectivity and up to 96% reactant conversion
- Developed and scaled up a novel biocatalyst immobilization method on amine-functionalized ion exchange resins, enhancing process viability from a 100 ml batch to a 3 L continuous flow reactor system
- Designed a cutting-edge reactor-separator system based on kinetic modeling, achieving selective separation of acetaldehyde and significantly improving catalyst longevity and turnover rates
- Drove a 50% reduction in the minimum selling price by optimizing process design in a techno-economic feasibility study, integrating Aspen Plus® modeling with detailed cost estimation

3) Graduate Research Assistant

Indian Institute of Technology Guwahati

• Enhanced the electrical conductivity of polyvinyl alcohol-carbon fiber nanocomposites by 6 orders of magnitude above the original polymer, demonstrating a strong grasp of polymer characterization and process optimization

4) Quality Control Engineer

Coca Cola India

- Managed beverage production within a 26-member team, ensuring process safety, product and packaging quality through rigorous online monitoring and laboratory testing
- Supervised 20+ technicians and operators, overseeing plant documentation and coordinating with production and logistics teams to ensure seamless operations

August 2019 – February 2024

Lawrence, KS, United States

August 2017 – July 2019

December 2016 – June 2019

Guwahati, India

Kolkata, India

Skills

- Analytical Skills: GC, HPLC-MS, 1D and 2D NMR, UV-vis, SEC/GPC, TLC, DSC, TGA, SEM, FTIR, ICP-OES, BET
- **Technical Skills:** Enzyme kinetic modeling, reactor design and optimization, working with Swagelok fittings and tubings, Aspen Plus, technoeconomic modeling
- Lab Practices: Good laboratory practices, troubleshooting, SOP creation, safety inspections
- Communication: Excellent verbal and written communication, technical report writing, stakeholder presentations.
- Data Analysis: Python for data preprocessing, feature selection, and hyperparameter optimization

Journal Publications

- Sharma, V.K., Cosse, K.J., Binder, T.P., McFarlane, J.S., and Allgeier, A.M. (2023). Biocatalytic Furfuryl Alcohol Production with Ethanol as the Terminal Reductant Using a Single Enzyme. ACS Sustainable Chem. Eng. *11*, 10767–10775. <u>https://doi.org/10.1021/acssuschemeng.3c01588</u>.
- Sharma, V.K., Binder, T.P., and Allgeier, A.M. (2024). Conceptual Process Design and Techno-Economic Analysis of Biocatalytic Furfural Hydrogenation Using Ethanol as the Terminal Reductant. ACS Sustainable Chem. Eng. *12*, 10776–10785. <u>https://doi.org/10.1021/acssuschemeng.4c01718</u>.
- Sharma, V.K., Binder, T.P., and Allgeier, A.M. (2023). Covalent Immobilization of Yeast Alcohol Dehydrogenase on an Amine-Functionalized Polymeric Resin Enhances Stability for Furfural Hydrogenation to Furfuryl Alcohol Using Ethanol as the Terminal Reductant. Ind. Eng. Chem. Res. *62*, 17604–17615. https://doi.org/10.1021/acs.iecr.3c02526.
- Sharma, V.K., Chakraborty, G., Narendren, S., and Katiyar, V. (2023). Fabrication and characterization of conductive electrospun nanofiber mats of carbon nanofiber/poly(vinyl alcohol)/poly(lactic acid) ternary nanocomposites for flexible electronics applications. Mater. Adv. *4*, 6294–6303. https://doi.org/10.1039/D3MA00670K.
- Sharma, V.K., Hutchison, J.M., and Allgeier, A.M. (2022). Redox Biocatalysis: Quantitative Comparisons of Nicotinamide Cofactor Regeneration Methods. ChemSusChem 15, e202200888. <u>https://doi.org/10.1002/cssc.202200888</u>.

Patents

• A. M. Allgeier, V. K. Sharma, T.P. Binder, Methods for the Biocatalytic Production of Acetaldehyde. US20230295670A1, September 21, 2023. https://patents.google.com/patent/US20230295670A1/en. (*under review*)

Conference Presentations

- Sharma, V. K; Binder, T. P.; Allgeier, A. M. "Synthesis and characterization of immobilized yeast alcohol dehydrogenase for biomass-based feedstock valorization," 2023 ACS Spring meeting, *Indianapolis, IN*.
- Sharma, V. K.; Binder, T. P.; Allgeier, A. M. "Biocatalytic production of chemical derivatives from biomass-based feedstock," 2022 AIChE annual meeting, *Phoenix*, AZ.
- Sharma, V. K.; Cosse, K. J.; Binder, T. P.; McFarlane, J. S.; Allgeier, A. M. "Biocatalytic furfuryl alcohol production using ethanol as the reductant at high titer," 2022 ACS Spring meeting, *San Diego, CA*.
- Sharma, V. K.; Maroo, V.; Cosse, K. J.; Binder, T. P.; McFarlane, J. S.; Allgeier, A. M.; "Better than ethanol? Biocatalytic approaches to the manufacture of acetaldehyde," **2021 ACS Spring meeting** (*virtual*)

Awards and Scholarships

- Best Poster Presentation Award, Great Plains Catalysis Society Fall Symposium, 2023.
- "Outstanding GTA" award from the Department of Chemical and Petroleum Engineering, University of Kansas, 2022 received for exceptional contribution to undergraduate teachning and mentoring.
- "Next Generation Scholarship" from the Kansas Corn Commission, 2021 & 2022 received for research and innovation efforts towards valorization of corn ethanol and diversification of downstream products.

References

- Available upon request