

PROMOTION RECOMMENDATION  
The University of Michigan  
College of Engineering  
Department of Chemical Engineering

Nirala Singh, assistant professor of chemical engineering, Department of Chemical Engineering, College of Engineering, is recommended for promotion to associate professor of chemical engineering, with tenure, Department of Chemical Engineering, College of Engineering

Academic Degrees:

Ph.D. 2015 University of California Santa Barbara, Chemical Engineering, Santa Barbara, CA  
B.S. 2009 University of Michigan, Chemical Engineering, Ann Arbor, MI

Professional Record:

2018 – present Assistant Professor, Department of Chemical Engineering, University of Michigan  
2016 – 2017 WRF Innovation Fellow, Department of Chemical Engineering, University of Washington, Seattle, WA  
2015 – 2017 Post-Doctorate Research Scientist, Institute for Integrated Catalysis, Pacific Northwest National Laboratory, Richland, WA

Summary of Evaluation:

Teaching: Professor Singh has been involved in teaching three courses at the University of Michigan. One of these courses, ChE 496/696/MSE 593, Electrochemistry Applications and Engineering, is a new elective course developed and introduced by Professor Singh (taught five times) and adds tremendous value to the department's teaching portfolio. Students view him as an accessible mentor and a conscientious teacher. Professor Singh has also demonstrated a willingness to advise undergraduate students as individual researchers and members of the ChE Car competition team. Professor Singh has established a strong record of mentoring and advising students at multiple levels. He has graduated five Ph.D. students (two co-advised) and is currently advising and co-advising another six Ph.D. students. In addition, Professor Singh has mentored five post-doctoral fellows (two co-advised), five master's and 16 undergraduate students. He has served as a member of 48 Ph.D. thesis committees. Besides the consistently high Q1(4.8) and Q2 (4.9) scores, he has also received consistently high scores for course quality and higher than average scores for instructor quality (Q199, Q217, and Q230). His effective interaction with a diverse student body is expressed in the score of 4.9 for Q217 in every course he taught.

Research: Professor Singh's research focuses on applying fundamental principles from electrochemistry, surface science, and catalysis to solve critical challenges in energy storage, environmental remediation, and fuel production. He has made important contributions, including identifying the structure of electrolytes for redox flow batteries, quantifying kinetic rates for surface reactions as a function of electrolyte composition for fuel production, and developing novel metal alloys for more active and stable electrodes in nitrate remediation. Another hallmark accomplishment of his work is developing a new theory that quantifies the influence of solvation in aqueous electrolytes on adsorption energies. He has written a series of papers on this topic, which have been extensively cited. In his third area of research, Professor Singh is pioneering electrochemical methods for wastewater remediation, specifically targeting nitrate reduction. While

in rank, he published 29 journal articles, of which 23 are based on research done at Michigan. Of these, 20 are co-authored by members of Professor Singh's research group. His students or post-doctoral scholars are first authors on 15 of these 20 papers. His h-index is 25, and his work has been cited nearly 3,600 times (per Google Scholar). A paper in *ACS Catalysis* co-authored in 2019 with UM collaborator, Bryan Goldsmith, already has well over 325 citations. Four of the papers from his Michigan research have been cited >50 times, indicating the rapid and strong impact that his work is having on the field. Professor Singh also has an exceptional record of grant writing and securing funding. As either the PI or co-PI, he raised more than \$9.5M since starting his tenure-track appointment. Of the \$9.5M, \$3.3M was raised by him as PI (sole or lead) and \$4M supports his research program.

#### Recent and Significant Publications:

- Cailin A. Buchanan, Dylan Herrera, Mahalingam Balasubramanian, Bryan Goldsmith and Nirala Singh, "Unveiling the Cerium (III)/(IV) Structures and Charge-Transfer Mechanism in Sulfuric Acid," *JACS Au*, 11/15/2022; 2(12): 2742-2757.
- Z. Wang, D. Richards, N. Singh "Recent discoveries in the reaction mechanism of heterogeneous electrocatalytic nitrate reduction," *Catalysis Science & Technology*. 2021; 11(3): 705-725.
- Z. Wang, S. D. Young and B. R. Goldsmith, N. Singh, "Increasing Electrocatalytic Nitrate Reduction Activity by Controlling Adsorption through PtRu Alloying," *Journal of Catalysis*, 03/2021; 395: 143-154.
- N. Singh and B. R. Goldsmith "Role of Electrocatalysis in the Remediation of Water Pollutants," *ACS Catalysis*, 2020; 10: 3365-3371.
- H. Agarwal, J. Florian, B. R. Goldsmith, and N. Singh, "V<sup>2+</sup>/V<sup>3+</sup> Redox Kinetics on Glassy Carbon in Acidic Electrolytes for Vanadium Redox Flow Batteries," *ACS Energy Letters*, 2019; 4:2368-2377.

Service: Professor Singh's service to the profession is exemplified by his elected roles as the president, vice president, and treasurer of the Michigan Chapter of the North American Catalysis Society (NACS). He is highly sought after for his expertise in reviewing proposals, major research activities, and journal articles. Moreover, he has refereed over 200 journal articles for esteemed publications such as *Science*, *Nature Materials*, *Journal of the American Chemical Society*, *Joule*, *ACS Energy Letters*, *ACS Catalysis*, and *Journal of Catalysis*. Since 2018, he has served as the faculty advisor for the undergraduate student team ChemE Car. He came up with a nine-step plan to enhance diversity within the ChemE Car team for the AIChE ChemE Car competition, resulting in a significant increase in female participation, raising it from one to seven female team members who attended the regional competition. This achievement has had a profound impact on the inclusivity and diversity of the ChemE Car team.

#### External Reviewers:

Reviewer A: "...Nirala is making outstanding contributions in research, teaching, and service. He is a good citizen at the University of Michigan and, more broadly, in the catalysis community outside of Michigan. He is a major asset to our field, and I strongly endorse his tenure and promotion to the rank of Associate Professor."

Reviewer B: "...it is a pleasure to very strongly recommend Professor Singh for tenure at University of Michigan with no reservations. He is an excellent researcher, contributes broadly to the community, and is fantastic teacher. I would certainly vote in favor of his tenure at my institution."

Reviewer C: “In terms of estimating Dr. Nirala Singh’s standing in relation to others in his peer group, I would assess him in the top 5%. His work is thorough, innovative, creative and provides insights both at a fundamental basic science and applied level. This is very hard to accomplish, especially in the field of electrochemistry.”

Reviewer D: “...I provide my strongest support for Nirala’s promotion and tenure. He is a rising star and collaborative force who has had and will continue to have great impact on catalysis driven by electric fields. He has a trademark way of approaching catalysis science that I know will influence many in the community.”

Reviewer F: “Dr. Singh’s commitment to excellence in research, teaching and service is clear from his record. He is very well-placed to continue his trajectory of success as he further advances in his career and would be an asset to any Chemical Engineering department in the country.”

Summary of Recommendation: Professor Singh’s research activities are very impressive in scholarship and impact. He has established himself as a leader in the fields of catalysis science and electrocatalysis. It is with the support of the College of Engineering Executive Committee that I recommend Nirala Singh for promotion to associate professor of chemical engineering, with tenure, Department of Chemical Engineering, College of Engineering.



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Steven L. Ceccio, Ph.D.  
Interim Dean of Engineering  
Vincent T. and Gloria M. Gorguze Professor  
of Engineering  
College of Engineering

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