LSU College of Engineering

Chemical Engineering

LECTURE SERIES

Dr. Jovan Kamcev

Assistant Professor
University of Michigan
Tuesday, October 15
10:30-11:30 pm
1124 Patrick Taylor Hall

Controlling the Selectivity of Charged Polymer Membranes

Membrane-based technologies are poised to play a pivotal role in meeting the escalating global demand for clean water and sustainable energy due to their efficiency, compact footprint, and operational simplicity. Ion-exchange membranes (IEMs), which are made from charged polymers, are used in electrochemical technologies for water purification (e.g., electrodialysis, membrane capacitive deionization) and energy generation/storage (e.g., reverse electrodialysis, electrolysis, fuel cells, flow batteries). IEMs must transport ions that complete the electrical circuit while preventing the transport of other solutes. Some relevant examples include separating H+ from V2+, V3+, V4+, and V5+ in vanadium redox flow batteries; Na+ from Cl- in electrodialysis; and OH-/CO32- from neutral products (e.g., ethanol) in CO2 electrolyzers. Two key properties that significantly influence the performance of IEMs are the ohmic resistance, which affects energy consumption, and membrane selectivity, which determines the overall process efficiency. While ohmic resistance is an extrinsic property that can be modulated by adjusting membrane thickness, selectivity is intrinsic and considerably more challenging to optimize. Membranes with enhanced selectivity are critical for advancing the adoption of electrochemical membrane technologies for water purification, energy generation, and energy storage. In this presentation, I will discuss our recent progress in understanding and improving IEM selectivity. Specifically, I will discuss 1) the design of ultrahigh charge density IEMs for enhanced separation of oppositely charged ions and 2) the factors that govern selectivity among similarly charged ions.

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Bio:

Dr. Jovan Kamcev is an Assistant Professor of Chemical Engineering and Macromolecular Science & Engineering at the University of Michigan. Prior to joining the University of Michigan in Fall 2019, he completed his postdoctoral training in Chemistry at University of California, Berkeley under the guidance of Prof. Jeffrey Long. He earned his Ph.D. in Chemical Engineering in 2016 from The University of Texas at Austin under the guidance of Profs. Benny Freeman and Donald Paul. His research group focuses on developing structure/property relationships to guide the design of next-generation polymeric materials (e.g., membranes and sorbents) for water treatment, energy generation, and energy storage applications. He has been recognized with several awards including the DOE Early Career Award, NSF CAREER award, NAMS Young Membrane Scientist Award, AIChE's 35 Under 35 Award, and ACS PMSE Early Investigator Award..