

# Beyond Size and Charge: Molecular Origins of Selective Ion Transport in Membranes



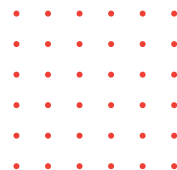
**JOVAN KAMCEV**

Associate Professor of Chemical  
Engineering and Macromolecular Science  
University of Michigan

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Electrochemical membrane-based technologies are poised to play an important role in meeting the growing global demand for clean water, sustainable energy, and critical materials because of their high efficiency, compact footprint, and operational simplicity. Central to these technologies are ion-exchange membranes (IEMs), which are made from charged polymers that regulate the transport of ionic species. Two properties are particularly important to membrane performance: membrane resistance, which influences energy consumption, and ion selectivity, which determines separation efficiency. Although membrane resistance can often be reduced through changes in thickness, selectivity is governed by complex molecular interactions and is therefore considerably more difficult to control. Developing membranes with enhanced and predictable selectivity is essential for expanding the use of electrochemical membrane processes. In this presentation, I will discuss our recent efforts to uncover the molecular origins of ion selectivity in IEMs.