Designing microporous polymers for gas and solvent separations

Speaker

Zachary P. Smith

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The chemical and petrochemical industries consume nearly 30% of global energy use, nearly half of which is a result of chemical separations. A major opportunity exists in identifying more efficient, productive, and environmentally friendly processes that operate in a continuous fashion. One attractive possibility is membrane-based separations, but significant materials limitations exist in designing membranes that can selectively distinguish between molecules with sub-angstrom differences in size and nearly identical thermodynamic properties. To survey these challenges and describe emerging opportunities, a brief overview of the current state-of-the-art in membrane-based materials and applications will be presented. Next, several design strategies will be presented on how to leverage pore structure and pore functionality to control separation performance. A particular emphasis will be placed on new materials chemistries with a focus on testing materials under complex gas and solvent mixtures. Microporous materials, including polymers of intrinsic microporosity (PIMs), will be highlighted to demonstrate the many opportunities that exist for scientists and engineers to tackle global challenges in chemical separations today.

Zachary P. Smith *is an Associate Professor of Chemical Engineering at MIT. He has been recognized with several awards, including the DoE Early Career Award, NSF CAREER Award, ONR Young Investigator Award, AIChE 35 Under 35 Award, AIChE Kunesh Award for Separations, and the North American Membrane Society Young Membrane Scientist Award. He was also awarded the Frank E. Perkins Award for Excellence in Graduate Advising at MIT. Prof. Smith serves on the Board of Directors for the North American Membrane Society and is an Associate Editor for Industrial & Engineering Chemistry Research. He is a co-founder and Chief Scientist for Osmoses Inc., a startup company aiming to commercialize membrane technology.*

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