Department of Chemical Engineering Seminar Series

Molecular Scale Engineering of Membranes for Energy-Efficient Separations

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Abstract

Designing new membranes with a set of previously unachievable transport properties will have an enormous impact on many applications, including energy-efficient separations, energy storage and health-related devices. The advancement of these technologies is highly dependent on polymer membranes which selectively transport only desired penetrants while maintaining chemical stability.

Molecular transport in polymer membranes is greatly influenced by chemical and morphological structures of polymers. Here two research projects are presented for designing new membranes for improved molecule separations. The transport mechanism in polymer membranes is studied from the fundamental perspectives of polymer-penetrant interactions and templating diffusion pathways for selective transport of small molecules.

First, controlling diffusional pathways in charged polymer membranes by solvent-free, green chemistry is presented for water purification and desalination. Second, designing highly structured polymer membranes for a new emerging biomedical application, "drug capture", to minimize the side effects of cancer drugs during chemotherapy, is discussed.

BACKGROUND

Hee Jeung Oh is currently a postdoctoral scholar in the Department of Chemical and Biomolecular Engineering at the University of California, Berkeley. She earned her bachelor's degree in Chemical Engineering from the Korea Advanced Institute of Science and Technology (KAIST). Hee Jeung completed her graduate training in Chemical Engineering working in Profs. Donald Paul's and Benny Freemans' research groups at the University of Texas at Austin, exploring a variety of polymeric materials for membrane-based separation. Her PhD work focused on a new membrane formation method using a state-of-the-art multi-nanolayered technology, mainly aimed at desalination and water purification, and development of structure-property relationships for water and salt diffusion and sorption in charged polymers. Her postdoctoral training, working in Prof. Nitash Balsara's research group at UC Berkeley, focuses on designing mesoporous nanostructured polymers for energy storage, as well as for a new emerging biomedical application, "drug capture," to minimize the side effects of cancer drugs. Hee Jeung has 9 peer-reviewed publications and one issued patent, and has been recognized with several awards including Doh Wonsuk Memorial Award from Korean Institute of Chemical Engineers, the University of Texas at Austin Professional Development Award, and Korea Foundation for Advanced Studies Fellowship.

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