



Functional Membrane Materials: Opportunities in Water Treatment

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9:15 am Coffee
9:30 am Seminar
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Responsible management of the world's water resources is essential to supporting human life on earth and the growing global population will only increase the demand for clean water resources. The success of reverse osmosis seawater desalination highlights the crucial role membrane separations will play in helping society meet the demand for fresh water. In this talk, a next generation membrane platform generated from self-assembled block polymer templates will be highlighted. Compared to current commercial membranes, which contain pores with a disperse size distribution, membranes derived from a block polymer template contain a high density of pores with a single size. This well-defined nanostructure results in membranes that offer higher size-selectivity and throughput. However, realizing the promise of these materials relies on being able to control their nanostructure and chemistry while processing them in a high throughput manner. The recently-developed self-assembly and non-solvent induced phase separation, or SNIPS, process meets these requirements, and allows large areas of membrane with a well-defined, tunable nanostructure to be produced readily from these novel macromolecules. Furthermore, using innovative macromolecular design results in membranes that can be chemically tailored, in a facile and scalable manner, to meet the specific needs of a multitude of applications. Applications that highlight the use of this versatile membrane platform for the purification and conservation of fresh water resources will be detailed.

William A. Phillip received his B.S. in Chemical Engineering from the University of Notre Dame in 2004; and completed his Ph.D. in Chemical Engineering under the guidance of Dr. Ed Cussler at the University of Minnesota in 2009. Following his Ph.D., Dr. Phillip completed a postdoctoral appointment with Dr. Menachem Elimelech at Yale University. He is currently an Assistant Professor in the Department of Chemical and Biomolecular Engineering at the University of Notre Dame, where he heads the Water purification and Advanced Transport Engineering Research (WATER) laboratory. The WATER lab examines how the structure and chemistry of polymeric membranes affect diffusion and flow across them. By understanding the connection between functionality and property, Professor Phillip and his group are able to design and fabricate novel membranes that provide more precise control over the transport of chemical species. These material advantages are then leveraged to design systems capable of enhancing chemical separations at the water-energy nexus. The WATER lab has been recognized with the 3M Non-Tenured Faculty Award, the Army Research Office Young Investigator Program, and the North American Membrane Society's Young Membrane Scientist Award.