Nanoporous Poly(aniline) Membranes for Size-Selective Separations

Michael A. Hickner, Department of Materials Science and Engineering
The Pennsylvania State University

Selective separation membranes with controllable permselectivity are critical components in low-energy separation processes for the chemical industry. Dense polymer membranes are currently useful for many important separations, however, their flux is undesirably low. Membranes with built-in nanoporosity may allow for significant improvements in membrane flux while maintaining permselectivity based on the size of the nanopores. We have developed thin-film membranes that can be selectively be doped and dedoped to create nenoporous structures which allow the transport properties of the membranes to be controlled. With PRF funding, we have established membrane flux control through modifying the extent of doping. We are now extending this approach to smaller dopants to tune nanopore size and different dopant/polymer systems to create a range of materials that show this general phenomenon of dopant induced nanoporosity. Additionally, we are working on Raman spectroscopy-based methods for detecting interesting analytes in separations experiments and using non-contact methods to measure changes in the membrane *in-situ* during operation.

Notable outcomes from our work include:

- fabrication of thin-film active separation layers on microporous supports
- controlled permeation by doping ratio
- measurement of nanoporsity by SANS and correlation to permeation properties