

NANO HIGHLIGHT

Nanocomposites for Molecular Sieving

NSF NIRT Grant NSF/CTS-0403574

PIs: Michael Tsapatsis (tsapatsi@cems.umn.edu), Frank S Bates, William J Koros, Eva Marand, Sankar Nair, Associate Member: Efrosini Kokkoli
University of Minnesota, Georgia Institute of Technology, Virginia Polytechnic Institute
Collaborations: NIST, Pall Corp., Science CentrUM
Web site: <http://www.cems.umn.edu/research/tsapatsis/NIRT/index.htm>

This interdisciplinary research team works towards the development of a new nanostructured membrane technology. We combine novel nanometer-thick selective porous inorganic layers with existing and newly synthesized polymeric matrices employing new synthetic and processing technologies. The ultimate goal is to design and fabricate materials with superior permeability properties that are amenable to large scale production as thin skin asymmetric hollow fibers and sheets.

Significant developments of the first year include:

1. Ion exchange and exfoliation of the first layered silicate with three-dimensional microporous layers.
2. Fabrication for the first time of polymer/silicate nanocomposite hollow fibers.
3. The development of a molecular model that is capable of describing gas transport in nanocomposites (Figure 1).

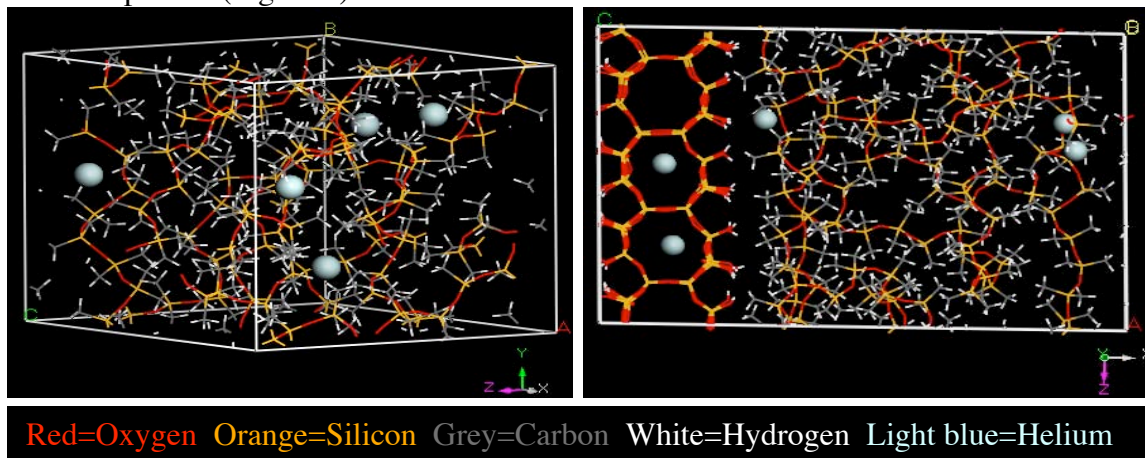


Figure 1: Molecular models of PDMS (left) and PDMS/AMH-3 (right) with He as penetrant atoms. Nair Group Georgia Tech.

Relevant Publications:

1. Jeong et al., **Nature Materials** 2:(1), 53-58 (2003) *A Highly Crystalline Layered Silicate with Three-Dimensionally Microporous Layers.*
2. Jeong et al., **Chemistry of Materials** 16:(20), 3838-3845 (2004) *Fabrication of Polymer/Selective-Flake Nanocomposite Membranes and Their Use in Gas Separation.*
3. **U.S. Patent 6,863,983 B2**, "Layered Silicate Material and Applications of Layered Silicates with Porous Layers" Tsapatsis, M., Nair, S. and Jeong HW, 2005.