

Zachary P. Smith

“Zach”



Graduate Institution: The University of Texas at Austin

Location: Austin, TX

Graduate Discipline: Chemical Engineering

Hometown: Camp Hill, PA

Research Interests:

The use of membrane systems for gas separations has recently been identified as an emerging area of membrane technology. Since membranes utilize a pressure driving force for separation, there is little energy loss compared with conventional methods such as cryogenic distillation, which utilizes a thermal driving force. Several important types of separations include nitrogen/oxygen from air, carbon dioxide from natural gas, and paraffins from olefins. Each of these separations currently occurs via distillation or adsorption. If properly designed, membranes could accomplish the same types of separations at higher throughput and lower energy costs.

My research focuses on a new class of thermally rearranged (TR) polymers for CO₂ separations from natural gas. TR polymers are highly insoluble in traditional solvents and have a very rigid structural form. The rigid structural form is desirable for highly permeable, highly selective, and plasticization-resistant membranes; however, the intrinsic insolubility of TR polymers has frustrated attempts to cast polymer films from solution, a process which is required to fabricate polymers into geometrically useful membrane films. This fabrication challenge has recently been overcome through a novel synthesis route where TR polymers are formed by converting ortho-functional polyimide films into TR polymers through a thermal reaction that occurs in the solid state. Therefore, insoluble TR polymers can be synthesized through a soluble polyimide precursor. My research will focus on characterizing chemical variations of these polymers for gas separation applications.

About me:

My ultimate career goal is to become a professor in Chemical Engineering and work in the field of membrane research. The fundamental use of chemistry and physics to design materials which facilitate transport at a molecular level has always fascinated me. Besides research, I am actively involved with science outreach programs for high school students, I play guitar and piano, and I coach an intramural soccer team.



U.S. DEPARTMENT OF
ENERGY

Office of
Science