

142u Synthesis & Characterization of Polyimide/ POSS Nanocomposites

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While polymers are widely used in membranes for gas separations, commercially available polymeric membranes are limited to low temperature applications. For typical polymers the permeabilities increase and permselectivities decrease with increasing temperature due to high chain segment mobility. Mixed matrix (MM) materials which consist of an inorganic and organic component provide an attractive alternative due to their processibility and mechanical stability. Polyhedral Oligomeric Silsesquioxanes (POSS) have an inner inorganic framework of silicon and oxygen that nanosize particles that have been used as an inorganic moiety for hybrid materials. The POSS cage has an inner inorganic framework made up of silicon and oxygen $(\text{SiO}_{1.5})_x$ that is externally covered by organic substituents. Recent studies indicate that POSS may provide permeation pathways for small molecules at elevated temperatures.

The paper discusses efforts to incorporate POSS into the polymer matrix by 3 different techniques: simple blending with the polymer, in-situ polymerization, reacting with short chain oligomer and blending with the base polymer. Preliminary studies show an increase in glass transition temperature with increasing POSS content. This indicates that these materials are easily homogeneously rigidified into the polymer matrix and help increase the operating temperature range of these polymers. High temperature gas permeation with focus on hydrogen separation is of prime interest and will be discussed in this poster.