IMSTEC Abstract

Title: The Effects of Physical Aging and Plasticization on Novel Poly(benzimidazole) Gas Separation Membranes

To ameliorate the effects of anthropogenic climate change, high temperature membrane-based gas separation technologies have been proposed to limit the release of carbon dioxide into the atmosphere. Poly(benzimidazole) (PBI) polymers are a promising candidate material for pre-combustion carbon capture due to their high thermal and chemical stability and attractive gas transport properties at high temperatures. Unfortunately, low solubility and complex processing procedures have prevented PBIs from becoming a viable option for large-scale applications. As a result, improving solubility and simplifying processing procedures have been the focus of many studies of PBIs. A new processing technique of densifying PBI sol-gel membranes produced via a polyphosphoric acid (PPA) process was developed. This direct casting method bypasses the need for the PBI to be dissolved in an organic solvent, greatly expanding the number of PBI chemistries that can be processed into membranes. No PBI membranes made using this densification process have been tested as gas separation membranes. Investigation of the hydrogen and carbon dioxide transport properties of these newly-processable PBI chemistries provide an opportunity to further the understanding of structure-property relations of PBI variants. Physical aging and plasticization phenomena are characterized independently as well as simultaneously to determine the relationship between them in addition to the magnitude of their effects on gas transport properties.