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Polyphosphazene polymer development for mixed matrix membranes using SIFSIX-Cu-2*i* as performance enhancement filler particles

Surendar Venna[1,2*], Alex Spore[3], Zhicheng Tian[4], Anne Marti[1], Erik Albenze[1], Hunaid Nulwala[1,5], Nathaniel Rosi[3], David Luebke[1], David Hopkinson[1], Harry R. Allcock[4*]

[1] DOE National Energy Technology Laboratory, Pittsburgh, PA

[2]AECOM, Pittsburgh, PA

[3]University of Pittsburgh, Pittsburgh, PA,

[4]Department of Chemistry, Pennsylvania State University, University Park, PA,

[5]Department of Chemistry, Carnegie Mellon University, Pittsburgh, PA

surendar.venna@netl.doe.gov

hra1@psu.edu

*Corresponding authors.

Abstract

Phosphazene-based polymers were synthesized by using different pendant groups such as trifluoroethoxy (TFE), phenoxy (PHO) and octafluoropentoxy (OFP). High performance methoxyethoxyethoxy/cyclohexoxy (MEE/CH) based polyphosphazene was developed for the first time in literature using a mixed-substitution method. The structural, chemical, and thermal properties of these polymers were analyzed using several techniques such as Gel Permeation Chromatography (GPC), Thermal Gravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC), and Nuclear Magnetic Resonance (NMR). Significant differences in gas transport properties of gases have been observed between these pendant groups because of their differences in glass transition temperature and physical interaction with CO_2. For the first time, we report on the high performance of TFE polyphophazene based mixed matrix membranes (MMMs) using a SIFSIX-Cu-2*i* (SIFSIX) metal organic framework (MOF) as the filler particles. These MMMs