Abstract

Over the past few decades, polymeric membrane-based gas separation technology has been widely used for a variety of industrial gas separations applications over other separation techniques like cryogenics distillation, adsorption, and absorption. This superiority is due to certain advantages which membrane technology benefits from low capital investment, low weight, and space requirement and high process flexibility. In interaction with a membrane, a high degree of permeability coupled with a large selectivity of a specific gaseous species ensures superior performances in the gas processing industry. In this occasion, gas separation membranes must have sufficiently good mechanical and film-forming properties with a good chemical and thermal stability under the conditions of the separation process. In regard to this, chemists show interest in the preparation of new robust membranes having high permeability and permselectivity values.

Thus, the principal goal of our present research was to develop cardo aromatic poly(arylene ether)s (PAEs) and poly(ether imide)s (PEIs) membranes and the systematic investigation of their gas transport properties towards four different gases (CH_4, N_2, O_2 and CO_2) at three different temperatures [35, 45 and 55 ^oC] and 3.5 bar of applied pressure. Four series of cardo polymers [PAE I-V, PAE VI-X, PAE XI-XVI, and PEI XVII-XXI] were synthesized. Transparent and flexible membranes were prepared from these PAEs and PEIs. The membranes were well characterized by different instrumental techniques and gas transport properties were studied. PAE XVI showed highest gas permeability for CO_2 [74.7 Barrer] and O_2 [18.5 Barrer] in this investigation. However, PEI XXI exhibited highest permselectivity towards CO_2/CH_4 and O_2/N_2 gas pair [P_{CO2}/P_{CH4} = 78.2 and P_{O2}/P_{N2} = 20.2] in comparison to other polymers in this present investigation. Finally, an attempt has been made to understand the structure-property correlationship between polymer molecular structure and their gas transport properties.

Keywords: *Fluorinated polymer, Cardo poly(arylene ether)s, Cardo poly(ether imide)s, Thermal properties, Mechanical properties, Dielectric constant, Gas permeability, Ideal permselectivity.*