P-5-854

POLYMER INCLUSION MEMBRANE (PIM) USING D2EHPA AS CARRIER FOR GAS PERMEATION

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Membrane technology for gas separation and purification has received global attention. The polymeric membranes present a good compromise between cost and separation properties. However, the problem for their final industrial implementation is the difficulties to obtain membranes with high gas permeability and selectivity. In this work the permeability of hydrogen, nitrogen, carbon dioxide, helium, oxygen and methane was investigated through PIMs (Polymer Inclusion Membranes) based on cellulose triacetate (CTA) polymer incorporating an acidic carrier D2EHPA. Experiments were conducted in a constant pressure system, and pure gas permeability/selectivity data were reported. The manufactured membranes have been characterized by Scanning Electron Microscopy (SEM) (morphology), Fourier Transform Infrared Spectroscopy (FTIR) (chemical structure), SEM-EDAX (chemical analysis) and TGA (thermal analysis). The membranes thickness was measured by digital micrometer. The permselectivity of the membranes were measured by using pure gases. The permeation rate order is the following: He > H2 > CO2 > O2 > CH4 > N2 in the pure CTA at 25 °C. For the samples where the plasticizer (2-NPOE) is added, the ideal permselectivity values, measured trough these membranes, result lower than those calculated in neat polymer. On the contrary, the permeability values result significantly higher according to the role of the plasticizer in the sample. In this case the permeation rate order of the gas species is the following: CO2 > H2 > CH4 > He>O2> N2 since the permeability of the gases characterized by high solubility values (e.g. CO2, CH4) is significantly enhanced as occurs for instance in rubbery materials. PIMs, prepared adding the carrier (D2EHPA) in the polymer solution, are characterized by a significant increase of the permeation rate of all gases (up to two order of magnitude for some species) combined to a decrease of permselectivity values, specially according to the different transport mechanism.