293a Enhanced Gas Separation Performance in Polyethersulfone (Pes)-Modified Zeolite Mixed Matrix Membranes

Yi Li, Tai-Shung Chung, and Santi Kulprathipanja

Organic polymer-inorganic molecular sieve composites have received world-wide attention during last two decades. This is due to the fact that the resultant materials may potentially offer superior performance in terms of permeability and selectivity for gas/liquid separation. Basically, the polymer-molecular sieve composites are formed by incorporating an active molecular sieve material into a polymer matrix, thus combining and synergizing the properties of two components for practical applications.

We have studied the fabrication and characterization of polymer-molecular sieve mixed matrix membranes (MMMs) with the chemical modification of molecular sieve surface in this presentation. The molecular sieves involved were commercial zeolite 3A, 4A and 5A, while the glassy polymer used was polyethersulfone (PES). The elementary analysis, X-ray photoelectron spectroscopy (XPS) and Brunaer-Emmett-Teller (BET) were used to characterize the modified zeolite, while the differential scanning calorimetry (DSC) and scanning electron microscope (SEM) were used to characterize the mixed matrix membranes. Compared with the pure polymer membranes and MMMs made from the unmodified zeolite, these MMMs made from the modified zeolite possessed the enhanced gas separation performance. A modified Maxwell model was proposed in this presentation. It took the effect of zeolite surface modification on polymer chain rigidification and partial pore blockage of zeolites into calculation. This modified model showed much consistent permeability and selectivity predication with experimental data.