334a Fabrication and Characterization of Zeolite/Polymer Mixed Matrix Nano-Composite Hollow Fiber Membranes

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Organic and inorganic polymer nano-composites have received world-wide attention during last two decades. This is due to the fact that the resultant materials may offer superior performance in terms of mechanical toughness for engineering resins, permeability and selectivity for gas/liquid separation, and photoconductivity for electronics. Nanocomposites made of polymers, metals, and ceramics have been employed widely in healthcare industry to substitute degenerated tissues or organs. Basically, the nano-polymeric composites formed by incorporating an active material into a polymer matrix, thus combine and synergize the properties of two components for practical applications.

We will give a review on the fabrication and characterization of polymer-molecular sieve mixed matrix membranes (MMMs) in this presentation. The molecular sieves involved were various sizes of zeolite. Compared with the pure polymer membranes, these MMMs possessed the enhanced gas separation performance, especially at high zeolite loadings. A new modified Maxwell model will be proposed to combine the effects of polymer chain rigidification and partial pore blockage of zeolites into calculation. The new model shows much consistent permeability and selectivity predication with experimental data.

Dual-layer hollow fibers with a thin zeolite/polymer mixed matrix outer selective layer have been developed by the co-extrusion technology. The effect of processing conditions on particle distribution and the membrane separation will be presented. It is believed that the heat treatment and a two-step coating process contribute together to bring out the superior separation properties of zeolite beta imbedded in the polymer matrix.