Chemical Engineering Doctoral Defense

Synthesis and Characterization of ZIF-71/PDMS Mixed Matrix Membranes for Biofuel Separation Through Pervaporation

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abstract

Biofuels are the most promising alternative to fossil fuels. The most widely used biofuel separation technique is distillation combined with molecular sieve dehydration process. However, distillation is energy intensive. Pervaporation has emerged as a promising alternative to distillation due to its energy efficiency.

Membrane is the key for pervaporation to be competitive with distillation separation. Our research focuses on the development of zeolitic imidazolate framework-71 (ZIF-71)/polydimethylsiloxane (PDMS) mixed matrix membranes (MMMs) to separation ethanol and 1-butanol from aqueous solutions. Both addition cure and condensation cure PDMS systems were applied for the membrane synthesis. The compatibility between ZIF-71 and the two systems was investigated. Different ZIF-71 loading PDMS MMMs were made and their alcohol/water separation performance was evaluated. Different size ZIF-71 particles were synthesized and the effect of particle size on membrane performance was studied. ZIF-71 surface modification was carried out to improve surface hydrophobicity, and its effect on membrane performance was analyzed.

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