

Ultrathin Tin-Silicalite 1 Zeolite Membrane in Ester Solvent Recovery

Authors : Kun Liang Ang, Eng Toon Saw, Wei He, Xuecheng Dong, Seeram Ramakrishna

Abstract : Ester solvents are widely used in pharmaceutical, printing and flavor industry due to their good miscibility, low toxicity, and high volatility. Through pervaporation, these ester solvents can be recovered from industrial wastewater. While metal-doped silicalite 1 zeolite membranes are commonly used in organic solvent recovery in the pervaporation process, these ceramic membranes suffer from low membrane permeation flux, mainly due to the high thickness of the metal-doped zeolite membrane. Herein, a simple method of fabricating an ultrathin tin-silicalite 1 membrane supported on alumina tube is reported. This ultrathin membrane is able to achieve high permeation flux and separation factor for an ester in a diluted aqueous solution. Nanosized tin-Silicalite 1 seeds which are smaller than 500nm has been formed through hydrothermal synthesis. The tin-Silicalite 1 seeds were then seeded onto alumina tube through dip coating, and the tin-Silicalite 1 membrane was then formed by hydrothermal synthesis in an autoclave through secondary growth method. Multiple membrane synthesis factors such as seed size, ceramic substrate surface pore size selection, and secondary growth conditions were studied for their effects on zeolite membrane growth. The microstructure, morphology and the membrane thickness of tin-Silicalite 1 zeolite membrane were examined. The membrane separation performance and stability will also be reported.

Keywords : ceramic membrane, pervaporation, solvent recovery, Sn-MFI zeolite

Conference Title : ICGC 2019 : International Conference on Green Chemistry

Conference Location : San Francisco, United States

Conference Dates : June 06-07, 2019