Pervaporation of n-butanol and other fermentation broth components in ZSM-5/PDMS mixed matrix membrane

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The performance of ZSM-5-filled PDMS MMMs for the pervaporation (PV) of n-butanol (n-BuOH) and other fermentation broth components was examined. Initial PV operations using n-BuOH aqueous solutions were carried out at varied feed concentrations, temperatures and ZSM-5 loadings. Increase in zeolite loading exhibited the most remarkable effect in improving the n-BuOH selectivity. The decrease in n-BuOH permeability with increased feed concentration suggests a saturation on zeolite sorption. Only zeolite loading significantly affected the water transport, which may be associated to the highly hydrophobic character of ZSM-5. Furthermore, PDMS matrix swelling was substantially controlled upon ZSM-5 addition. The MMM performance with multicomponent feed showed that the least hydrophobic ethanol was the least permeable among the organic components whereas water exhibited coupling effect with acetone. This work was supported by Priority Research Centers Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology (2012-0006693).