Thesis Title	Study of Properties of Organic Compounds Affecting Permeation through Carbon Membrane
Thesis Credits	12
Candidate	Miss Laong Khuanongkun
Thesis Advisor	Assoc. Prof. Dr. Anawat Sungpet
Program	Master of Engineering
Field of Study	Chemical Engineering
Department	Chemical Engineering
Faculty	Engineering
B.E.	2554

Abstract

Permeation through inorganic membranes involved the adsorption of molecules on the membrane surface and the diffusion of the molecules through pores of membrane. In this research, permeation of organic compounds having different dipole moments and molecular diameters through the carbon membranes was investigated. The carbon membranes were synthesized from commercially available Kapton® polyimide, which was carbonized at 600 °C under nitrogen atmosphere at the heating rate of approximately 10.7 °C/min. The influence of feed compositions, and modes of operations, i.e. pervaporation (PV) and vapor permeation (VP), was also studied. The single-component permeation tests were carried out with methanol, ethanol, isopropanol and acetone as feeds, whereas bi-component experiments were performed with methanol/acetone, methanol/ethanol, isopropanol/acetone and acetone/ethanol mixtures. From single-component feed experiments, it was found that the organic compounds with smaller molecular sizes generally had the higher permeability than that of the larger molecules. The exception was the higher permeability of acetone over ethanol, which was a result of higher interactions between acetone and the membrane surface. Given approximately the same molecular diameters, acetone was more permeable than isopropanol because it was more adsorbable. Experiments with bi-component feeds revealed that smaller molecules in the mixtures had higher permeabilities than those of the larger molecules even though they were probably less adsorbed. Nonetheless, in comparison with their permeability in the absence of more adsorbable molecules, permeability of these smaller organic compounds was reduced. An interesting result was the reverse selectivity of membrane towards ethanol instead of acetone. It was probably because, when mixed with acetone, ethanol adsorption capability increased. For molecules with approximately the same sizes, i.e. acetone and isopropanol, better adsorption ability of acetone resulted in its higher permeability. Finally, the relative permeability of organic compounds was the same for PV and VP.

Keywords: Pervaporation / Vapor permeation / Carbon membrane / Molecular sieving