

## **CHAPTER V**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Conclusions**

Polybenzoxazine (PBZ) membranes were successfully synthesized from bisphenol-A, formaldehyde, and two types of diamines, hexamethylenediamine (hda) and ethylenediamine (eda). It was found that both poly (BA-hda) and poly (BA-eda) membranes were suitable for ethanol/water separation at the thickness of 200  $\mu\text{m}$  with the feeding temperature of 70°C. Moreover, poly (BA-hda) membrane provided high permeation flux and separation factor with increasing ethanol concentration but poly (BA-eda) membrane obtained similar permeation flux and separation factor for each ethanol concentration. However, both poly (BA-hda) and poly (BA-eda) membrane showed insignificant effect on the separation efficiency with continuous increasing ethanol concentration. Therefore, to separating bioethanol from fermentation process which have about 12 %, poly (BA-hda) membrane was the most proper membrane.

#### **5.2 Recommendations**

According to this work, it is recommended that to synthesize poly (BA-eda) membrane, the stirring rate should be slow in order to reduce the bubble from evaporating solvent. Besides, the polybenzoxazine membranes should be placed in close system to slowly remove the solvent out of the membranes.