CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

All mixed matrix membranes were prepared by solution-casting method and evaluated for the gas permeation rates and selectivities of CO_2/CH_4 and CO_2/N_2 at room temperature by single gas measurements.

The incorporation of solid components; AC, NaX and LiX, into the MMMs exhibited decreases in N_2 and CH_4 permeation rates, as an increase in solid component loading. Besides CO_2 permeation rate increased as the increase of solid loading but decreased when the sufficient amount of solid that fulfilled the transient gap of membrane phase was added. 10% zeolite loading was the optimum amount to achieve for good selectivities.

The incorporation of liquid; PEG and DEA, were effective to improve the separation performance of MMMs. Though the selectivities were increased, the gas permeation rate decreased consequently as an increase in liquid loading due to the fact that the liquid densified the intersegmental packing of membrane phase. In addition, PEG gave better selectivities than DEA based on the solution-diffusion mechanism.

All studied MMMs showed the typical trade-off relationships of permeability and selectivity which are consistent to literature data. Plasticization studies showed that only CO_2 permeation rate increased with increasing feed pressure, CH_4 and N_2 permeation rates were independent of pressure. The plasticization observed on the MMMs investigated resulted from the CO_2 plasticization of cellulose acetate.

5.2 Recommendations

From this work, the PEG/NaX/SR/CA MMMs showed good properties for CO_2/CH_4 and CO_2/N_2 separation, however they cannot overcome the CO_2 plasticization problem. Commercial cellulose acetate which used as porous support sheet was the cause of plasticization, not a mixed matrix phase. Therefore, to further develop the membranes that can be able to maintain high separation performance in the presence of condensable plasticizing component such as CO_2, Thermal annealing and crosslinking method would be a new approach to suppress the plasticization in glassy polymer like cellulose acetate. It is expected to tighten the packing of polymer chains and also reduce chain mobility while exposing with the plasticizing gas molecules.