CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Cellulose acetate mixed matrix membranes were studied for their separation performance and the plasticization was investigated by evaluating the single gas permeation rates of CO_2, CH_4, C_3H_6, and C_3H_8 at room temperature. All the mixed matrix membranes were prepared by the solution-casting method. NaA, NaX, NaY, CaA, and silicalite were used as solid adsorbents in the MMMs. In addition, polyethylene glycol (PEG) was adsorbed into NaX in order to prepare a liquid-solid adsorbent in the MMMs.

CO_2-induced plasticization was found in cellulose acetate membrane leading to reducing the selectivity. However, all studied CA MMMs were successful in the plasticizing suppression.

The incorporation of all types of adsorbents studied, except silicalite into the MMMs, demonstrated that the CO_2/CH_4 selectivity was enhanced by the solubility. Furthermore, CaA-CA MMMs, NaY-CA MMMs and silicalite-CA MMMs can enhance the C_3H_6/C_3H_8 selectivity. The enhancement of CaA-CA MMMs was controlled by the molecular sieving mechanism whereas that of NaY and silicalite was controlled by the solubility factor.

5.2 Recommendations

From this work, it was found that the incorporation of different types of zeolite into cellulose acetate mixed matrix membranes can enhance both CO_2/CH_4 and C_3H_6/C_3H_8 selectivity. In addition, they can reduce the plasticization. Therefore, future work should focus on other types of polymer membranes to improve the membrane separation performance, towards high selectivity and high permeability.