CHAPTER V

CONCLUSIONS AND SUGGESTION

5.1 Conclusions

In this study, polyurea microcapsules containing leuco dye (CVL) dissolved in diisopropylnaphthalene were prepared by interfacial polymerization. Homomixer type batch reactor was used to produce microcapsule emulsion by pouring an aqueous solution of 2.6% poly(vinyl alcohol) as emulsifying agent. The effects of core-to-wall ratios, diisocyanate types and ethylene diamine (EDA) were investigated on the morphologies, particle size distribution, thermal properties and the encapsulation efficiency. In terms of carbonless paper application, developed image intensity on the dye acceptor coated paper was determined. The morphological results taken by SEM demonstrated that the polyurea microcapsules from a higher MDI concentration had rough surface. MDI-based microcapsules gave rise to the better thermal stability than that of HDI-based microcapsules. The higher MDI concentration yielded a premature reaction of leuco dye, which was consequently developed a blue color in the emulsion. The optimum amount of EDA for the higher MDI containing microcapsules was 0.01 mole, which can improve the encapsulation efficiency of CVL therein.

5.2 Suggestions for Future Work

It is well known that the narrow size distribution of microcapsules provided the satisfactory image intensity and smudge free copies, which cannot be achieved with the broad particle size distribution, especially with the large particles. Other than the type of wall material, affecting the particle size distribution, homomixing temperature or emulsifying agent temperature is the main factor to determine the size

and size distribution of microcapsules. Therefore, further research should be carried out on the temperature effect on particle size and particle size distribution. We could also concentrate on the microencapsulation efficiency using different types of diamine, either aromatic or shorter chain aliphatic type. Research on synthesis of the polyurea-urethane based microcapsules using a mixture of diamine and diol is one of the utmost current interest.

In the industrial practice, many types of the equipment to produce microcapsules other than batch reaction have been developed to achieve the narrow size distribution microcapsules with the high encapsulation efficiency. One of the convenient ways to carry out the synthesis is a continuous production of microcapsules with an upward vertical vessel as shown in Figure 5.1. The arrangement is designed to provide droplets, by injection through a nozzle of reactant A, which will undergo reaction with reactant B to produce the capsule wall along the vessel.

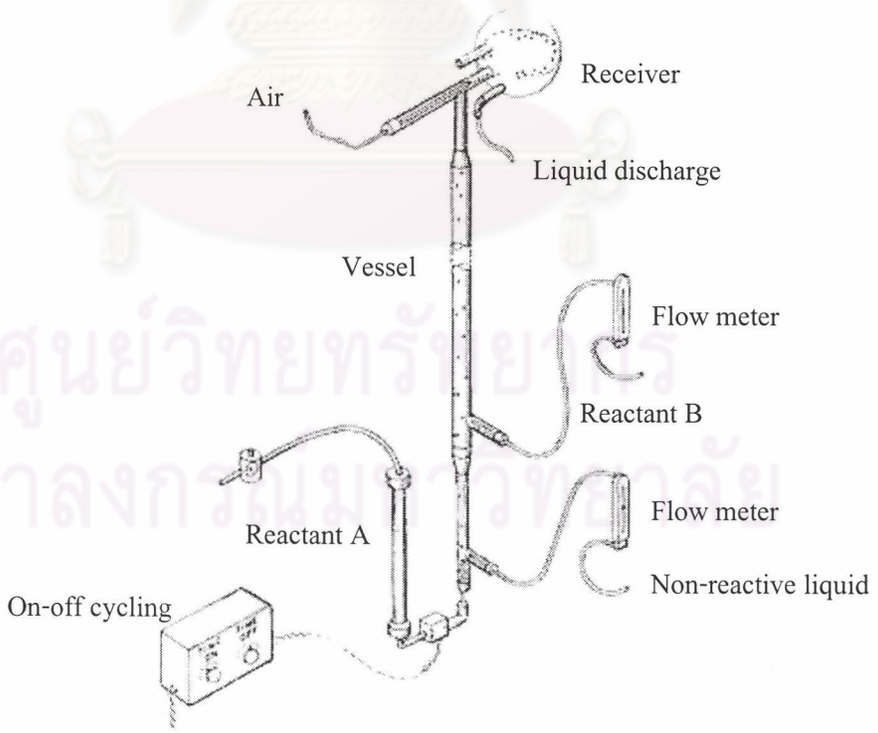

Figure 5.1 The apparatus for continuously producing microcapsules with upward vertical vessel.