CHAPTER IV

CONCLUSION AND SUGGESTION

4.1 Conclusion

Three derivatives of 10,12-pentacosadiynoic acid (PCDA), *i.e.* *N*-(2-aminoethyl)pentacosa-10,12-diynamide (AEPCDA), *N,N'*-ethylenebispentacosa-10,12-diynamide (EBPCDA) and *N*-(2-stearamidoethyl)pentacosa-10,12-diynamide (SEPCDA) can be synthesized from PCDA. Polydiacetylene vesicles can be prepared from the suspension of these diacetylene lipids in water and photopolymerized to form blue solutions of poly(PCDA), poly(AEPCDA), poly(EBPCDA) and poly(SEPCDA) vesicles. The prepared polydiacetylene vesicles were in the range of 100 nm. The vesicle solutions possess thermochromic properties with the color transition temperatures (CTT) in the order of poly(AEPCDA) < poly(PCDA) < poly(EBPCDA) ~ poly(SEPCDA). Excepting the first heating-cooling cycle, the thermochromism of poly(EBPCDA) and poly(SEPCDA) is completely reversible while those of poly(PCDA) and poly(AEPCDA) is not. Mixing of a long chain fatty acid with PCDA during the vesicle preparation can lower the CTT by the maximum of 10 °C. The optimum mixing condition is 30:70 mole ratio of PCDA:stearic acid (C18) with the total lipid concentration of 1.0 mM. The PVA films containing these polydiacetylene vesicles can be prepared by using a mixing-drying process. The blue colored thin polymer films show thermochromic properties similar to the solution with slight difference in the CTT order which is poly(30PCDA+70C18) < poly(AEPCDA) ~ poly(PCDA) < poly(EBPCDA). The PVA films containing these polydiacetylene vesicles should find their applications in indicative labeling for temperature concerned products such as foods, beverages and medicines.

4.2 Suggestion for future work

The results from this thesis provide some insight for logical design of thermochromic films containing polydiacetylene vesicles which can change color at

various temperatures. The CTT of the thermochromic films prepared in this work are in the range of 55-80 °C. The extension of the lower limit of the CTT may be acheivable by mixing stearic acid with AEPCDA or synthesizing new diacetylene lipids which can form weaker attractive interaction between the head groups e.g. *N*-alkyl-10,12-pentacosadiynamide. The extension of the higher limit of the CTT may also achievable by the synthesis of new diacetylene lipids which can form stronger interaction between the diacetylene substituents e.g. bis(10,12-pentacosadiynamide) derivatives of phenylenediamines.